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VOLUME VI, 1977-1978

*COMPLETE IN THREE QUARTERLY ISSUES
CONSISTING OF vi + 526 PAGES
INCLUDING FIGURES*

QK
600
M 992
V. 6
1977-78
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Published by

MYCOTAXON, LTD., P.O. BOX 264, ITHACA, NY 14850, USA

Printed in the United States of America

Volume VI

- p.130, 1.44, for *acetabulum* read *acetabulum*
p.227, 1.41, for *corticola* read *corticolum*
p.233, 1.5, for *SCHIZOXYLON HIPPOPHAES* read (*SCHIZOXYLON HIPPOPHAES*)
p.241, delete last line
p.259, 1.13, for *venezuela* read *venezuelae*
p.343, 1.29, for (p. read (p. 352).
p.375-377, throughout, for *lundelli* read *lundellii*

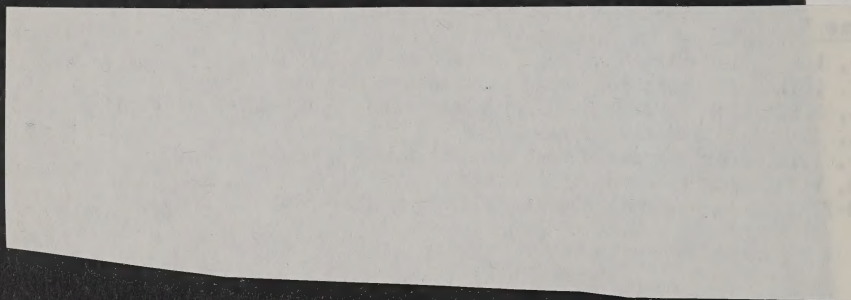


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MYCOTAXON PUBLICATION DATES,
1(1) THROUGH 6(2)

The publication date for the previous issue of MYCOTAXON is carried on the front cover. Since some libraries and individuals remove and discard covers when binding, we provide here the actual dates of publication of each of the issues that have appeared thus far:

1(1)	July-September 1974:	September 16, 1974
1(2)	October-December 1974:	December 16, 1974
1(3)	January-March 1975:	February 25, 1975
2(1)	April-June 1975:	May 12, 1975
2(2)	July-September 1975:	July 8, 1975
3(1)	October-December 1975:	November 7, 1975
3(2)	January-March 1976:	February 6, 1976
3(3)	April-June 1976:	May 6, 1976
4(1)	July-September 1976:	September 9, 1976
4(2)	October-December 1976:	December 18, 1976
5(1)	January-March 1977:	March 12, 1977
5(2)	April-June 1977:	May 6, 1977
6(1)	July-September 1977:	July 30, 1977
6(2)	October-December 1977:	November 4, 1977

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MYCOTAXON

AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION
OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS

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AUG 2 1977

[MYCOTAXON for April-June 1977 (5: 365-426)
was issued May 6, 1977]

ISSN 0093-4666 MYXNAE 6(1) 1-212 (1977)

Library of Congress Catalogue Card Number 74-7903

Published quarterly by MYCOTAXON, Ltd., P.O. Box 264, Ithaca NY 14850
For subscription details, see back cover

MYCOTAXON

Vol. VI, No. 1, pp. 1-5

July-September 1977

NOTES ON HYPHOMYCETES. XIX.

CLADOSPORIUM LEPROSUM SP. NOV. AND *CLADOSPORIUM NIGRELLUM*.

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ABSTRACT

Cladosporium leprosum Morgan-Jones is described, illustrated and compared with *Cladosporium nigrellum* Ell. and Everh., which is similarly treated.

INTRODUCTION

An unusual species of *Cladosporium* Link ex Fries, possessing aggregations of scurfy stromatic cells and partly scurfy semi-macronematous conidiophores, has been encountered growing on painted veneer in Alabama. Of species of *Cladosporium* known to occur on dead wood and bark it most closely resembles *C. nigrellum* Ellis and Everhart described from inner bark of *Robinia* used for railroad ties. It cannot however be considered conspecific with it. The fungus is described herein as a new species. It is compared with *C. nigrellum* which is described from its type collection.

TAXONOMIC PART

Cladosporium leprosum sp. nov. (Fig. 1).

Coloniae effusae, atrobrunneae vel fuscae, interdum olivaceo-brunneae, densae vel sparsae, crustaceae vel pulveraceae, plerumque orbiculares. Mycelium immersum vel superficiale, ex hyphis ramosis, septatis, pallide brunneis, 2.5 - 3.5 μ crassis compositum. Hyphae ex cellulis inflatis saepe compositae. Stromata frequenter adsunt vel rudimentale, ex cellulis brunneis, farinacea, isodiametricis, usque ad 10 μ crassa composita. Conidiophora macronemata vel semimacronemata, mononemata, ex hyphis superficialibus oriunda, simplicia vel ramosa, recta vel flexuosa, septata, plerumque inflatis, ad septa

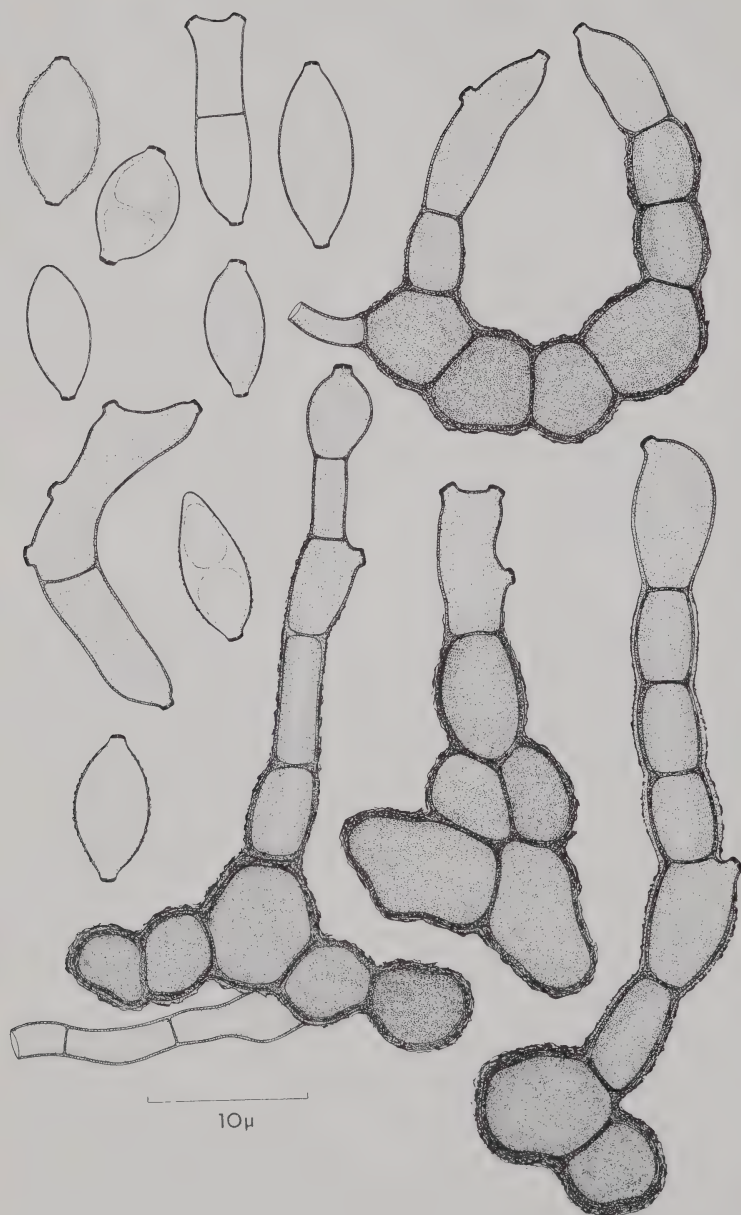


FIGURE 1. *Cladosporium leprosum*.
Conidiophores and conidia.

constricta, laevia vel farinacea, brunnea, apicem versus pallidiora, 12 - 55 X 4 - 5 μ . Cellulae conidiogenae polyblasticae, indeterminatae, in conidiophoris incorporatae, terminales, interdum intercalares, sympodiales, cylindricae vel doliiformes, usque ad 5 cicatrices atro brunneae, applanatas, incrassatas, protrudentes gerentes. Conidia catenata, sicca, ellipsoidea vel doliiformia, pallide brunnea, laevia vel verruculosa, 0 - 1 septata, ad bases cicatrice protrudenti et ad apice 1 - 4 cicatricibus protrudentibus, 9 - 16 X 4 - 5 μ .

In pictis superficiebus, Auburn, Lee County, Alabama, April 1976, G. Morgan-Jones, BPI, holotypus.

Colonies effuse, frequently irregularly orbicular, dark brown to blackish or greyish brown, sometimes dark olivaceous brown, dense or relatively sparse, crustaceous or powdery, varying in size. Mycelium partly immersed but mostly superficial, composed of pale brown, smooth, branched, septate 2.5 - 3.5 μ wide hyphae. Hyphae often irregular and inflated. Stromata present, mostly rudimentary, composed of globose or subglobose, isodiametric, brown, thick-walled, up to 10 μ wide cells the outer layer of whose walls breaks irregularly to give a farinaceous, scurfy appearance. Conidiophores macro-nematous or semimacronematous, arising singly or in small groups from the stromatic and hyphal cells, brown to pale brown, paler towards the apices, erect, straight or flexuous, simple or branched, usually septate, with cells frequently inflated, constricted at the septa, smooth or granular to farinaceous, thick-walled, 12 - 55 X 4 - 5 μ . Conidiogenous cells polyblastic, indeterminate, integrated, terminal and intercalary, pale brown to brown, when terminal usually smooth, otherwise at least in part roughened, cylindrical to doliiform, sometimes tapering towards the irregular apices, with up to 5 dark brown scars at the ends of protuberances produced sympodially or unsynchronised. Conidia solitary or in simple or branched chains, dry, ellipsoid or doliiform to subglobose, pale brown, smooth or verruculose, 0 - 1 septate, with 1 basal and 0 - 4 apical, protruding, thickened scars, 9 - 16 X 4 - 5 μ .

On painted surface; North America.

Collection examined: on painted surface of veneer, Auburn, Lee County, Alabama, April 1976, G. Morgan-Jones, BPI, AUA, type.

C. leprosum occurs solely on the paint and does not penetrate the veneer. It bears similarity to *Cladosporium nigrellum* in a number of respects but differs from it in its scurfy stromatic cells, less well developed conidiophores and in conidium shape and septation.

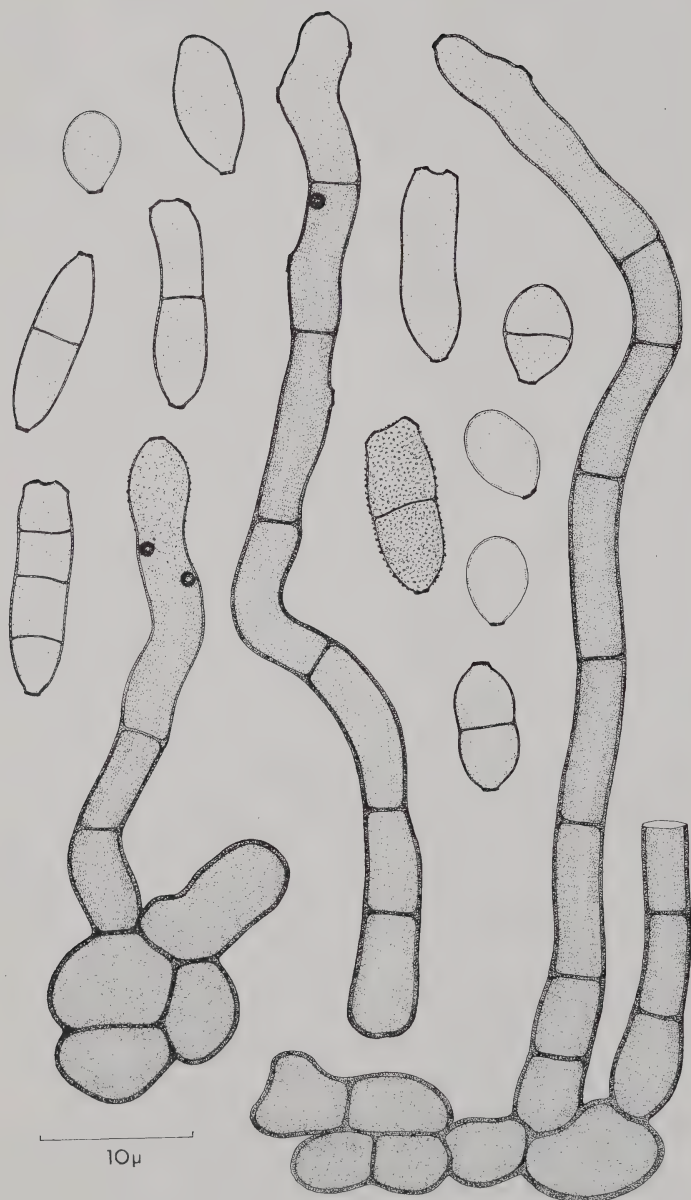


FIGURE 2. *Cladosporium nigrellum*.
Conidiophores and conidia.

Cladosporium nigrellum Ellis and Everhart, Proc. Acad. N. Sci. Philad. 1893:463, 1894 (Fig. 2).

Colonies widely effuse, dark brown or blackish olivaceous, velvety. Mycelium partly immersed in the substratum, partly superficial, composed of subhyaline to pale brown, smooth, branched, 3 - 4 μ wide hyphae. Hyphae frequently becoming inflated, constricted at the septa, and giving rise to aggregations of brown, thick-walled, stromatic cells, 5 - 9 μ wide, from which the conidiophores are produced. Conidiophores macronematous, arising singly or in small groups, brown to pale brown, paler towards the apex, thick-walled, smooth, erect, straight or more frequently flexuous, simple, septate, cylindrical, tapering very gradually towards the distal end, smooth or delicately verruculose towards the apex, 45 - 230 X 5 - 9 μ . Conidiogenous cells polyblastic, indeterminate, integrated, terminal and intercalary, pale brown to brown, cylindrical, with up to 3 dark brown scars. Conidia in simple or branched chains, dry, cylindrical, ellipsoidal or limonii-form, 0 - 3 septate, sometimes slightly constricted at the septa, pale brown, smooth or densely verruculose, with 1 basal and 0 - 2 apical thickened scars, 6 - 15 X 4 - 7 μ .

On inner bark of *Robinia*; North America.

Collections examined: on inner bark of *Robinia* railroad ties, Nuttallburg, West Virginia, U.S.A., October 1893, L.W. Nuttall, Flora of Fayette County, W. Va. no. 172, holotype, NY; Ellis and Everhart, Fungi Columbiani 382, NY; Ellis and Everhart, North American Fungi (second series) 3086, NY.

ACKNOWLEDGEMENT

I thank Dr. Clark T. Rogerson for making available on loan the material of *C. nigrellum* housed at the New York Botanical Garden and Dr. C. J. K. Wang for reviewing the manuscript.

MYCOTAXON

Vol. VI, No. 1, pp. 6-10

July-September 1977

THE SYNONYMY OF *STERIGMATOMYCES PENICILLATUS* AND *STERIGMATOMYCES POLYBORUS*

S. C. JONG and D. S. KING

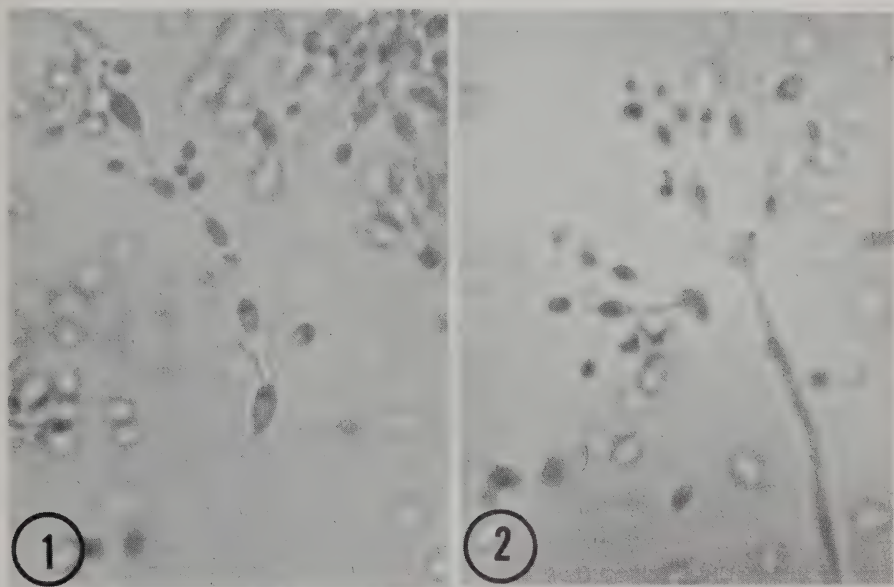
Mycology Department, American Type Culture Collection
12301 Parklawn Drive, Rockville, Maryland 20852

SUMMARY

Examination of *Sterigmatomyces penicillatus* strain ATCC 32128 (type), and *S. polyborus* strains ATCC 32821 (type) and ATCC 32822 in culture revealed that these strains are morphologically and physiologically very similar. The name *S. penicillatus* Rodrigues de Miranda, 1975, is proposed to be a later, facultative synonym of *S. polyborus* Scott & van der Walt, 1970. The distinguishing features of the species are discussed.

Rodrigues de Miranda (1975) recently described a new species of yeast, *Sterigmatomyces penicillatus* Rodrigues de Miranda, that produces extracellular starch-like compounds, a property which was not originally accepted in the diagnosis of the genus *Sterigmatomyces* Fell (1966). The two strains studied were isolated as contaminants on agar plates by G. Kraepelin in Germany. One of them, designated as the type culture, was deposited at the American Type Culture Collection as ATCC 32128. According to Rodrigues de Miranda, *S. penicillatus* is closely related to *S. polyborus* Scott & van der Walt (1970) in similarity of morphological features on potato dextrose agar and in failing to assimilate nitrate. They were stated to differ, however, by the ability of *S. penicillatus* to produce starch-like compounds and its inability to utilize raffinose and soluble starch as sole sources of carbon.

Sterigmatomyces polyborus was isolated from the tunnels of wood-boring beetles in Natal, South Africa. ATCC



Figs. 1-2. Conidia, sterigmata, conidiogenous cells and a blastese-like structure. 1. *Sterigmatomyces polyborus* ATCC 32821, 7 days PDA culture, lactophenol-cotton blue mount, ca. X 1,100. 2. *Sterigmatomyces penicillatus* ATCC 32128, 8 days PDA culture, lactophenol-cotton blue mount, ca. X 1,500.

32821 is the type culture for the species. The ATCC also maintains another strain (ATCC 32822) of *S. polyborus* which was obtained from the Centraalbureau voor Schimmelfcultures of the Netherlands; no isolation data are available for this strain. As indicated by the specific epithet, *S. polyborus* is characterized by its ability to utilize a rather wide range of carbon sources.

In our authentication of the imperfect yeast strains maintained in the mycological collection of the ATCC, we have examined the cultures of *S. penicillatus* ATCC 32128 and *S. polyborus* ATCC 32821 and ATCC 32822. On potato dextrose agar (PDA), they all produced *Penicillium*-like conidial heads of round or elongate cells with sterigmata

of various lengths (Figs. 1 & 2). We also observed non-septate filamentous cells which occasionally branch and resemble a ramified, one-celled blastese in culture of each strain (Fig. 2). However, ATCC 32128 produced the nonseptate blastese-like cells in greater abundance than did ATCC 32821 and ATCC 32822.

The results of our physiological tests are shown in TABLE I. All three strains produced extracellular starch-like compounds, although Scott and van der Walt (1970) reported ATCC 32821, the type of *S. polyborus*, to lack this ability. The method of Lodder (1970) was followed for this test, and was repeated several times. Furthermore, the production of starch by ATCC 32821 was much stronger than that observed for the second strain of *S. polyborus* (ATCC 32822) and the type of *S. penicillatus* (ATCC 32128). In their carbon assimilation patterns, ATCC 32821 and ATCC 32128 differed only in the utilization by the former of glycerol. ATCC 32822 failed to utilize both glycerol and α -methyl-D-glucose. These differences can only be considered significant at the strain level and can not justify establishing a new species. All three strains also were unable to utilize potassium nitrate or to grow at 37 C.

We are therefore convinced that ATCC 32128, ATCC 32821 and ATCC 32822 represent the same species. Consequently *Sterigmatomyces penicillatus* Rodrigues de Miranda (Antonie van Leeuwenhoek 41: 195, 1975) becomes a later, facultative synonym of *Sterigmatomyces polyborus* Scott & van der Walt (Antonie van Leeuwenhoek 36: 389, 1970).

Sterigmatomyces polyborus is readily distinguished from the other species of the genus morphologically by the formation of one-celled blastese-like structures and *Penicillium*-like conidial heads with elongate sterigmata and physiologically by its ability to utilize a wide range of carbon sources and the production of extracellular starch-like materials.

TABLE I. PHYSIOLOGICAL TEST RESULTS

	<i>S. penicillatus</i>	<i>S. polyborus</i>	
	ATCC 32128	ATCC 32821	ATCC 32822
Fermentation	-	-	-
Growth at 37 C	-	-	-
Assimilation of potassium nitrate	-	-	-
Formation of starch-like compounds	+	+	+
Assimilation of:			
Glucose	+	+	+
Galactose	+	+	+
L-sorbose	+	+	+
Maltose	+	+	+
Sucrose	+	+	+
Cellobiose	+	+	+
Trehalose	+	+	+
Lactose	+	+	+
Melibiose	+	+	+
Raffinose	+	+	+
Melezitose	+	+	+
Inulin	-	-	-
Soluble starch	+	+	+
D-xylose	+	+	+
L-arabinose	+	+	+
D-arabinose	+	+	+
D-ribose	+	+	+
L-rhamnose	+	+	+
D-glucosamine	+	+	+
Ethanol	-	-	+
Glycerol	-	+	-
<i>D</i> -Erythritol	+	+	+
Adonitol	+	+	+
Dulcitol	+	+	+
D-mannitol	+	+	+
D-sorbitol	+	+	+
α -methyl-D-glucoside	+	+	-
Salicin	+	+	+
Inositol	+	+	+
Lactic acid	+	+	+
Citric acid	+	+	+
Succinic acid	+	+	+
Valine	-	-	-
Glycine	-	-	-
Proline	-	-	-
Arginine	-	-	-

ACKNOWLEDGMENTS

We are grateful to Mrs. Kathryn Schmeding for her patience in repeatedly testing these strains for the production of starch-like compounds. This work was supported in part by the Brown-Hazen grant 846 from Research Corporation, New York.

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MYCOTAXON

Vol. VI, No. 1, pp. 11-16

July-September 1977

IDENTITY OF *STERIGMATOMYCES APHIDIS* AND *TRICHOSPORON ORYZAE*

S. C. JONG and D. S. KING

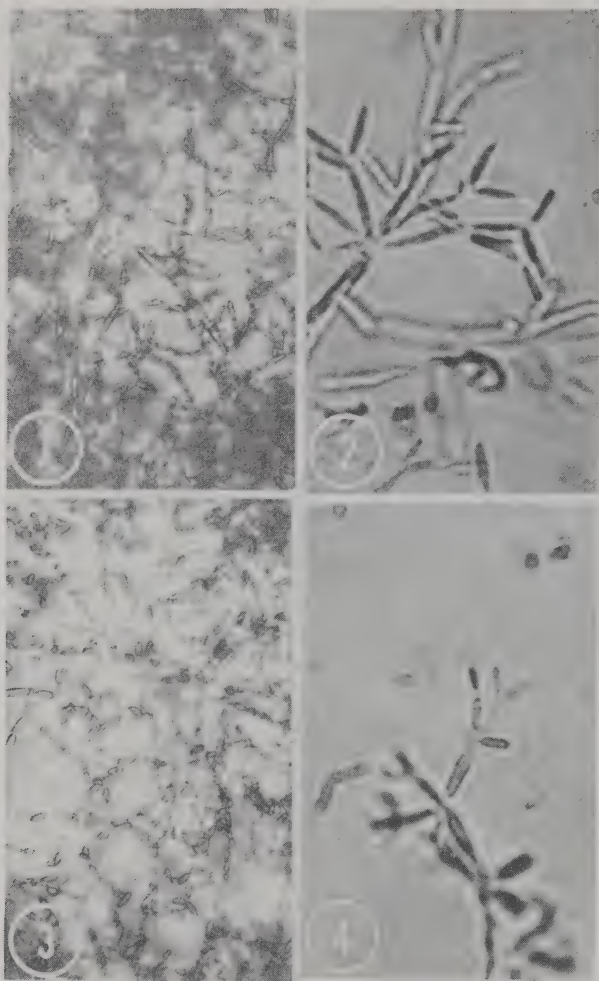
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SUMMARY

Morphological and physiological studies on the type cultures of *Sterigmatomyces aphidis* ATCC 32657, *Trichosporon oryzae* ATCC 28323 and *Candida edax* ATCC 18414 demonstrated that these strains are conspecific. Thus, *Sterigmatomyces aphidis* Henninger & Windisch, 1975, and *Trichosporon oryzae* Ito *et. al.*, 1974, are later, facultative synonyms of *Candida edax* van der Walt & Nel, 1968.

In the course of our current investigations into the systematics of imperfect yeast genera, thirteen strains originally assigned to the genus *Sterigmatomyces* Fell and forty-eight strains originally assigned to the genus *Trichosporon* Behrend, including the type strain of each species described, were examined morphologically and nutritionally. The type cultures of *Sterigmatomyces aphidis* Henninger and Windisch (1975) and *Trichosporon oryzae* Ito *et al.* (1974) were strikingly similar. Their affinities and taxonomic disposition are discussed herein.

Sterigmatomyces aphidis was described in 1975 by Henninger and Windisch. The type culture was isolated from the secretions of Aphididae on leaves of *Solanum pseudocapsicum* in Germany, and was deposited in the American Type Culture Collection as ATCC 32657. The non-filamentous yeast-like genus *Sterigmatomyces* with *S. halophilus* Fell as the type species is characterized by single cells that reproduce vegetatively by the forma-



Figs. 1 & 2. *Sterigmatomyces aphidis* ATCC 32657, PHB-agar culture. 1. On agar, *ca.* X 450. 2. Lactophenol-cotton blue mount, *ca.* X 1,000.

Figs. 3 & 4. *Trichosporon oryzae* ATCC 28323, PHB-agar culture. 3. On agar, *ca.* X 450. 4. Lactophenol-cotton blue mount, *ca.* X 1,000.

tion of holoblastic conidia on distinct sterigmata. The ability of ATCC 32657 to form true mycelium made its inclusion in this genus appear dubious.

In 1974, Ito *et al.* described a new species of yeast from unpolished new crop rice in Japan. The species exhibited high resistance to gamma radiation. It was named *Trichosporon oryzae* because morphological features of the fungus were interpreted to represent true mycelium, arthrospores and blastospores (budding cells). Strain ATCC 28323 is the type for the species.

Morphologically, both ATCC 32657 and ATCC 28323 produced filamentous growth that became septate on all solid media employed; this type of growth was particularly prominent on PHB agar (Matsushima, 1961), cornmeal agar and potato dextrose agar. Unicellular blastospores were borne laterally on septate hyphae. They either gave rise to short chains in acropetal succession (Figs. 2 & 4) or became detached and subsequently reproduced by budding (Figs. 1 & 3). The blastospores of ATCC 28323 (2-3 X 2-10 μ m) had a slightly greater width-to-length ratio than those of ATCC 32657 (1.4-3.6 X 4.3-11.5 μ m). Because ATCC 32657 produces true mycelia, and because no distinct chains of arthroconidia of the *Trichosporon* type as defined by King and Jong (1976) were observed in ATCC 28323, we are convinced that they do not belong in *Sterigmatomyces* or *Trichosporon*, respectively.

Physiologically, ATCC 32657 and ATCC 28323 were able to utilize a wide range of carbon compounds. Furthermore, they grew at 37 C and on vitamin free medium, and assimilated potassium nitrate (see TABLE I). ATCC 28323 deviated from the carbon assimilation pattern of ATCC 32657 in failing to utilize adonitol and dulcitol.

We consider the differences between these two strains to be significant only at the strain level and not at the specific level; thus, both strains represent the same species. Both the filamentous and the unicellular phase of these strains are typical of the genus *Candida*. According to the fermentation and assimilation patterns of the nitrate-positive *Candida* species given by

TABLE I
PHYSIOLOGICAL TEST RESULTS

ATCC Strain	18414	28323	32657
Fermentation	-	-	-
Growth in vitamin-free medium	+	+	+
Growth at 37 C	+	+	+
Assimilation of potassium nitrate	+	+	+
Assimilation of:			
Glucose	+	+	+
Galactose	+	+	+
L-sorbose	+	+	+
Sucrose	+	+	+
Maltose	+	+	+
Cellobiose	+	+	+
Trehalose	+	+	+
Lactose	+	+	+
Melibiose	+	+	+
Raffinose	+	+	+
Milezitose	+	+	+
Inulin	-	-	-
Soluble starch	+	+	+
D-xylose	+	+	+
L-arabinose	+	+	+
D-ribose	+	+	+
L-rhamnose	+	+	+
Ethanol	-	+	+
Glycerol	+	+	+
<i>D</i> -Erythritol	+	+	+
Adonitol	+	-	+
Dulcitol	+	-	+
D-mannitol	+	+	+
D-sorbitol	+	+	+
α -methyl-D-glucoside	+	+	+
Salicin	+	+	+
Lactic acid	+	+	+
Succinic acid	+	+	+
Citric acid	+	+	+

Grinbergs and Yarrow (1970), ATCC 28323 and ATCC 32657 differ from *Candida edax* van der Walt & Nel (1968) by utilizing ethanol as a carbon source, and ATCC 28323 differs further by failing to utilize adonitol and dulcitol (TABLE I). As noted before, differences of this magnitude are not significant at the specific level.

Further, examination of the type culture of *Candida edax* ATCC 18414 has confirmed the marked similarities of these three strains.

We therefore propose that *Sterigmatomyces aphidis* Henninger & Windisch (Arch. Microbiol. 105: 50, 1975) and *Trichosporon oryzae* Ito *et al.* (Agr. Biol. Chem. 38: 1599, 1974) are later, facultative synonyms of *Candida edax* van der Walt & Nel (Antonie van Leeuwenhoek 34: 106, 1968).

Candida edax was first found by van der Walt and Nel (1968) from frass recovered from deserted subcortical insect galleries in *Sclerocarya caffra* Sond. in the Transvaal of South Africa. The species is now also known from Japan and Europe, and is well established in different climatic regions of the world. Thus, it is a clearly defined fungus taxon.

ACKNOWLEDGMENTS

This work was supported in part by the Brown-Hazen Grant BH 846 from Research Corporation, New York.

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MYCOTAXON

Vol. VI, No. 1, pp. 17-23

July-September 1977

ACANTHOSTIGMELLA (HERPOTRICHIELLACEAE)

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SUMMARY

Five species of *Acanthostigmella* are recognized with the addition of the new species *A. pallida* and *A. pellucida*.

Several genera of Loculoascomycetes contain small hypersaprobies, in particular members of the Herpotrichiellaceae. Species of *Herpotrichiella* Petrak have dark grayish or olivaceous brown setose ascocarps, short apical periphysoids, and inequilateral, grayish or olivaceous brown ascospores with one or several septa. A small group of species is known which differs from species of *Herpotrichiella* in thinner, softer, more pallid peridium, light colored setae and hyaline or slightly pigmented ascospores. These species appear to deserve segregation and the generic name *Acanthostigmella* v. Hühnel is available to accommodate them.

Acanthostigmella was described with the sole species *A. genuflexa* v. Hühnel (1905). He later (1909a, 1909c) added two more species to the genus; the only other use of the name was by Linder (1929) when he described *A. thaxteri*. Von Hühnel (1905) observed that *A. genuflexa* was associated with *Helicosporium phragmitis* v. Hühnel on the old culms of *Phragmites*, and suggested that this might be the conidial state. However, in 1909b, von Hühnel associated *H. phragmitis* with *Tubeufia helicomyces* v. Hühnel. Webster (1951) confirmed the connection. Von Hühnel (1905) compared *Acanthostigmella* with *Nematostoma* Sydow, an epiphyte with pseudoparaphyses which belongs in the Dimeriaceae. *Aphanostigme* Sydow is also epiphytic on leaf hairs, and a member

of the Dimeriaceae. Clements and Shear (1931) synonymized *Acanthostigmella* under *Acanthostigma* de Not., while von Arx and Müller (1975) considered that it was a synonym of *Tubeufia*. *Tubeufia* Penzig & Sacc. differs from *Acanthostigmella* in broader peridium, pseudoparaphyses, and elongate phragmospores, whereas *Acanthostigma* apparently is sphaeriaceous.

Acanthostigmella v. Hühnel, Ann. Mycol. 3: 327. 1905.

Ascomcarps minute to small, setose, pallid or light to brown or grayish, superficial on a delicate hyphal subiculum; peridium thin, formed of few layers of compressed cells; periphysoids present in the apical region of locule, short. Asci bitunicate, oblong, obovate, saccate, without pseudoparaphyses. Ascospores fusoid elliptic, usually inequilateral, hyaline, yellowish, or light olivaceous brown, one to several septate, thin walled. Hypersaprobic on old plant remains or other fungi.

Type species: *Acanthostigmella genuflexa* v. Hühnel

Key to Species

1. Ascocarps 35-60 μm diam, nearly hyaline to straw colored, setae one celled, thick walled, hyaline to light brown, over old perithecia or stromata; ascospores 7.5-10 x 2.5-3.5 μm , 1-(3-)septate *A. pallida*
1. Ascocarps 80-180 μm diam, light brown, grayish or olivaceous, setae brownish or pallid at tips, on plant parts 2
 2. Setae one celled, thick walled, forming a whorl around and in apical pore, pointed, often recurved 3
 2. Setae one celled or septate, thin walled, over much of peridium, ends usually obtuse, straight . 4
3. Ascospores 9-11(-14) x 2-2.5(-3.5) μm , 1-, 2-(3-) septate *A. genuflexa*
3. Ascospores 15-20 x 3-3.5 μm , 4-5-septate *A. thaxteri*
4. Ascocarps grayish brown; ascospores 15.5-18.5 x 4-4.5 μm , (1-, 2-)3-septate . . *A. orthoseta*
4. Ascocarps light brown, pinkish tinged at times; ascospores (13.5-)15-23 x (4.5-)5-6(-7.5) μm , (1-)2-(3-)septate *A. pellucida*

Acanthostigmella genuiflexa v. Hühnel, Ann. Mycol. 3: 328. 1905. Figs. 1-3

Ascarps 90-104 μm diam, 117-130 μm high, globose conic, setae in a whorl around apex and short in apical pore, curved, light brown, up to 60 μm long, hyphae of subiculum light brown. Asci 30-35 x 5-6 μm . Ascospores 9-11(-14) x 2-2.5(-3.5) μm , hyaline singly, light yellowish brown in mass, fusoid elliptic, 1-2-(3-)septate, contents minutely guttulate.

On *Phragmites communis* Trin., Austria.

Material examined: Langenschönbiche bei Tulln, 3 Juni 1905, v. Hühnel (TYPE, FH).

The culms are fragmentary and ascarps difficult to locate; most of the information given above was obtained from two slides of type material prepared by von Hühnel.

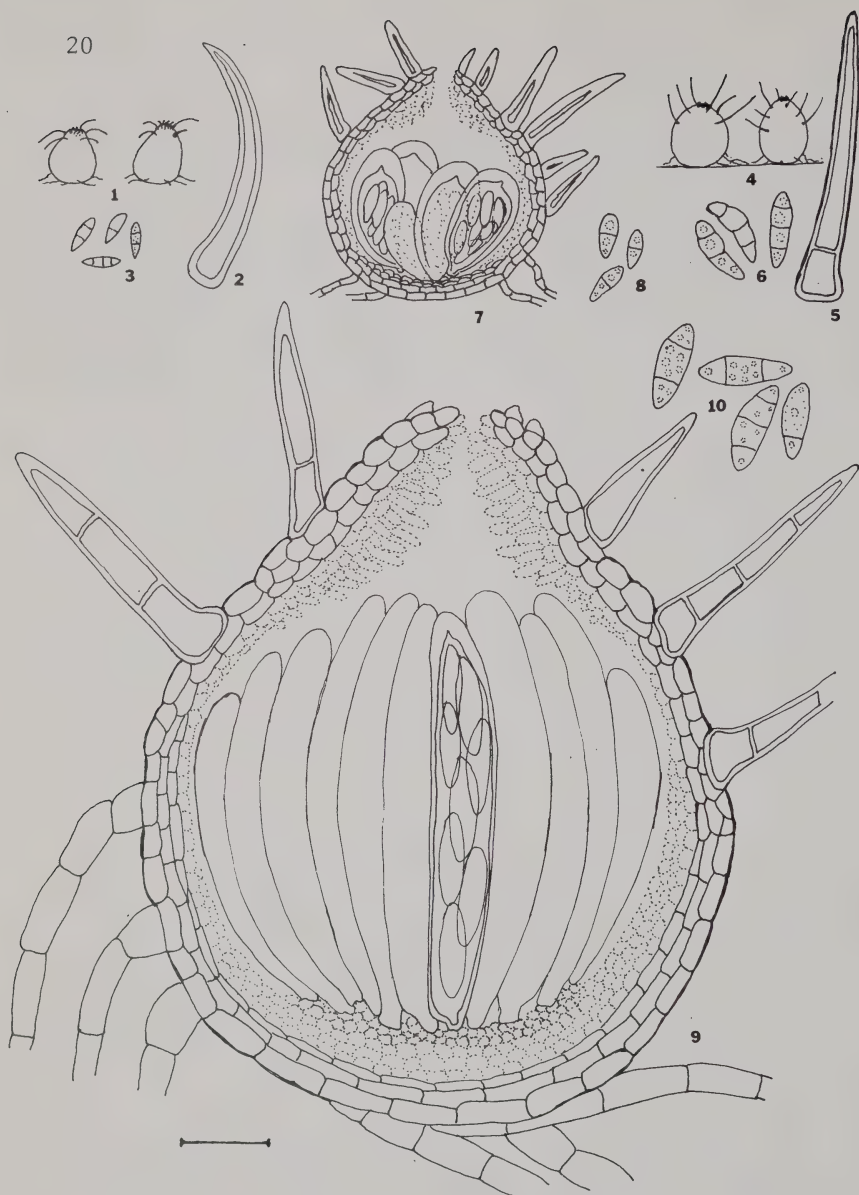
Acanthostigmella orthoseta v. Hühnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 1201. 1909. Figs. 4-6

Ascarps 80-140 μm diam, globose to conic, setae short around apical pore or elongate on sides of peridium, up to 40-130 μm long, 3.5-4.5 μm wide near base, hyphae of subiculum light brown to hyaline. Asci 33-46 x 7.5-11 μm . Ascospores 15.5-18.5 x 4-4.5 μm , hyaline at first, becoming dull grayish to olivaceous brown, fusoid elliptic, usually curved slightly, (1-, 2-)3-septate, slightly constricted at the middle septum and cell above somewhat broader than other cells, contents usually with one globule in each cell.

On dead stalks of herbaceous plants.

Material examined: Conway, Massachusetts, 8 Oct 1961, on *Polygonum* sp., Barr 3157 (MASS).

Acanthostigmella orthoseta was described from stalks of *Heracleum* sp. Von Hühnel (1909c) suggested that *A. zahlbruckneri* (Strasser) v. Hühnel, on stalks of *Mentha* sp. was perhaps a depauperate form of *A. orthoseta*, and indeed the descriptions provide little to differentiate the two beyond sparse setae on the peridium of *A. zahlbruckneri*.



Figs. 1-10. Species of *Acanthostigmella*. 1-3. *A. genuflexa*; 1. Ascocarps. 2. Seta from ascocarp. 3. Ascospores. 4-6. *A. orthoseta*; 4. Ascocarps. 5. Seta from ascocarp. 6. Ascospores. 7-8. *A. pallida*; 7. Ascocarp. 8. Ascospores. 9-10. *A. pellucida*; 9. Ascocarp. 10. Ascospores. Scale = 200 μ m for Figs. 1 and 4; 20 μ m for remainder of figs.

Acanthostigmella pallida Dennis & Barr, sp. nov. Figs. 7, 8

Ascocarpia 35-60 μm diametro, hyalina vel straminea, setis hyalinis vel brunneolis 6.5-30 μm longis ornatis. Asci 20-25 x 10-11 μm . Ascosporae 7.5-10 x 2.5-3.5 μm , hyalinae, fusiformae, 1- (vel 3-)septatae.

Holotypus insidens *Hypoxylo mammato*, ad "Dunworth Wood, Wiltshire, England, 19 Oct 1976," a J. B. Hindley lecto, in herbario K.

Ascocarps 35-60 μm diam, globose conic, nearly hyaline or light straw color, setae hyaline or light brownish, short, 6.5-30 μm long, ca. 5 μm wide near base, one celled, thick walled. Asci 20-25 x 10-11 μm . Ascospores 7.5-10 x 2.5-3.5 μm , hyaline, fusoid elliptic, straight or inequilateral, 1-(3-)septate, contents with one or a few globules in each cell.

On old *Hypoxylon mammatum* (Wahl.) Miller on *Salix* sp., *Lasiochaeria* sp. on *Acer* sp.

Material examined: Dunworth Wood, Wiltshire, England, 19 Oct 1976, J. B. Hindley (HOLOTYPE, K; ISOTYPE, MASS); Long Trail, Bolton, Vermont, U.S.A., 18 Aug 1964, Barr 4550 (MASS).

This minute species is readily overlooked. Under a dissecting microscope it could be confused with a hypocreaceous species which also occurs on old pyrenomycetes, but has a totally different centrum.

Acanthostigmella pellucida Barr, sp. nov. Figs. 9, 10

Ascocarpia 80-180 μm diametro, brunneola subrosea suffusa, setis septatis brunneolus 30-165 μm longis ornatis. Asci 45-70 x 9-16.5 μm . Ascosporae (13.5-)15-23 x (4.5-) 5-6(-7.5) μm , luteolae vel brunneolae vel subroseae, fusiformae, (1-)2-(3-)septatae.

Holotypus insidens *Taxo canadensi*, ad "Mt. Johnson, St. Gregoire, Quebec, 27 Jul 1957," a M. E. Barr lecto, in herbario MASS.

Ascocarps 80-180 μm diam, globose conic, light brown with pinkish tinge, setae septate, often elongate, 30-165 μm long, 5-6.5 μm wide near base, over much of peridium, hyphae of subiculum light brown or hyaline. Asci 45-70 x

9-16.5 μm . Ascospores (13.5-)15-23 x (4.5-)5-6(-7.5) μm , (1-)2-(3-)septate, yellowish or light brownish or pinkish, inequilateral, middle cell broadest of the three, contents minutely guttulate.

On overwintered plant parts: *Lycopodium obscurum* L., *Taxus canadensis* Marsh., *Buxus* sp., *Gaultheria procumbens* L., *Linnaea borealis* L. var. *americana* (Forbes) Rehd.

Material examined: Mt. Johnson, St. Gregoire, Quebec, Canada, 27 Jul 1957, Barr 1873 (HOLOTYPE); E. Millinocket, Penobscot Co., Maine, U.S.A., 7 Aug 1962, Barr 3584; top of Mt. Mansfield, Vermont, 15 Jul 1964, Barr 4319A; Sunderland, Massachusetts, 20 Jun 1958, Barr 2355; Amherst, Massachusetts, 9 Jun 1958, Barr 2331; Clarksburg State Park, Massachusetts, 12 Jul 1960, Barr 2706; Conway State Forest, Massachusetts, 15 Jun 1961, Barr 2911; New Salem, Massachusetts, 2 Aug 1961, Barr 3069 (all MASS).

This species was tentatively identified with *Herpotrichia parasitica* (Hartig) E. Rostrup, on the basis of Munk's (1957) description. However, pseudoparaphyses are present in the locule of *H. parasitica* and the ascospores differ in shape and constriction at the septa. The detailed description by Freyer and van der Aa (1975) of *H. parasitica* and the conidial *Pyrenochaeta parasitica* state make the differences between it and *A. pellucida* obvious.

Acanthostigmella thaxteri Linder, Ann. Missouri Bot. Gard. 16: 321. 1929.

Ascocarps 90 x 79 μm , pyriform, setae in irregular whorl around apical pore, 27-36 μm long. Asci 36-45 x 7.2 μm . Ascospores 15-20 x 3-3.5 μm , hyaline becoming subfuscous, 4-5-septate.

On *Costus spiralis* (?*Costus speciosus* (Koenig.) Sm.), Trinidad, West Indies.

The description is paraphrased from Linder's (1929) description and illustration (pl. 25, figs. 22-24) of *A. thaxteri*. This species appears to be closely related to *A. genuflecta* and to differ chiefly in longer ascospores with additional septa.

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MYCOTAXON

Vol. VI, No. 1, pp. 24-26

July-September 1977

THE CURRENT TAXONOMIC STATUS OF *DIPLODIA GOSSYPINA*

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During the course of an unpublished study of a hardwood canker disease caused by *Diplodia gossypina* Cke., it became necessary to involve myself with the taxonomy of the pathogen. Recently, other Forest Pathologists requested that I publish the conclusions to which I came. This paper summarizes the pertinent literature and presents a logical conclusion based on that literature. The concern here is mainly with *D. gossypina*, but other binomials will be mentioned when appropriate.

The genus *Diplodia* Fries was described in 1849 as having scattered subcutaneous to erumpent, black, characteristically papillate pycnidia; spores are septate, brown to dark. *Botryodiplodia* Saccardo, 1880, had clustered stromatic, hairless or hairy pycnidia, otherwise similar to *Diplodia*. *Chaetodiplodia* Karsten 1880 was also similar to *Diplodia*, but the pycnidia had hair, or bristles, and *Lasiodiplodia* Ellis and Everhart 1896 was distinguished as being stromatic and paraphysate. Taubenhaus (1915) was able to demonstrate that the above characters are not constant. He concluded that *Botryodiplodia*, *Chaetodiplodia*, and *Lasiodiplodia* are congeneric with *Diplodia*. The findings of later workers support his conclusions (Satour, et al., 1969; Satour and Hewitt, 1967; Webster et al., 1969). Satour et al., using defined carbon and nitrogen sources, demonstrated that only certain spore characteristics are constant. Brown (1971) found that newly formed pycnidia of *D. natalensis* on dead Valencia orange (*Citrus sinensis*) and grapefruit (*C. paradisi*) twigs are at first immersed and scattered in host tissue, but became progressively more stromatic and erumpent as the summer progressed. Therefore, all the generic characteristics used in this group have been found highly variable, with two possible exceptions. Taubenhaus (1915) found that paraphyses were highly variable, but Webster et al. (1967, 1969) found the presence or absence of paraphyses to be constant, although sometimes not easily seen in older pycnidia. It is possible that Taubenhaus did not realize the effect of

pycnidial age upon paraphyses. Paraphyses may, therefore, have taxonomic utility in this group, but need further study. Spore ornamentation is the one character which is apparently not variable (Satour et al., 1969; Satour and Hewitt, 1969; Webster et al., 1969). Until recently spore ornamentation has not been considered in the taxonomy of this group, consequently some Diplodia spp. have been described as having smooth spore walls, and some as having striate walls. The same situation holds for Botryodiplodia spp. (Satour et al., 1969; Satour and Hewitt, 1967). Von Arx (1970) has used spore ornamentation for generic separation in his key, but he recognizes Lasiodiplodia which, based upon information in the literature, is not tenable. His key is not clear at this point, but he characterizes Botryodiplodia as having smooth spores. If this is acceptable, Diplodia could be characterized as having striate ornamentations on its spore walls. Therefore, Taubenhaus' (1915) broadened description of Diplodia may be correct, except that the spores may be further described as striate when in the uniseptate state. The description of Botryodiplodia would be similar, except the spores are smooth when uniseptate.

Polach et al. (1969) and Webster et al. (1969), working with isolates of D. natalensis from grape (Vitis unifera), were able to show that spore size of cultures taken from single pycnidia varied as much as the spore sizes of cultures from different isolates. Some of these variations were statistically significant, though not taxonomically so. This indicates that while spore size may have validity in specific determinations in this group, a given species has an extremely wide spore size range. The original description of D. gossypina (Cooke, 1879) is rather meager, so Stevens (1925) had type material examined, and reported that spore size was 20-27 μm x 10-15 μm .

On the basis of evidence available in the literature as summarized above, I have tentatively regarded the following binomials as synonyms of D. gossypina:

Botryodiplodia gossypina E. & B.
B. theobromae Pat.
Chaetodiplodia grisea Petch
Diplodia cacaoicola P. Henn.
D. natalensis Evans
D. theobromae (Pat.) Now.
D. tubericola (Ell. & Ev.) Taub.
Lasiodiplodia theobromae (Pat.) Griff. & Maubl.
L. triflorae Higgins
L. tubericola Ell. & Ev.

The above list does not pretend to be exhaustive, but indicative. D. gossypina, as considered in this paper has a host range of about 138 plant species in fifty-eight

families (U. S. D. A. 1960). The host range for the entire Diplodia-Botryodiplodia complex may be much greater. This paper presents a basis for further work on the taxonomy of this group, as well as a definite reference for concerned plant pathologists.

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MYCOTAXON

Vol. VI, No. 1, pp. 27-28

July-September 1977

ROGERSIA, A LATER NAME FOR FILOSPORELLA

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Rogersia Shearer and Crane (1976) was published on the 13th of October, 1976, with *R. annelidica* Shearer and Crane as the type species. Conidium ontogeny in *Rogersia* is identical to that in *Filospora* Nawawi (1976) published on the 18th of September, 1976, with *F. aquatica* as the type species. We consider *Rogersia annelidica* distinct from *F. aquatica* since the conidia are always sigmoidal with the curvature in more than one plane while the conidia of *F. aquatica* are filiform. In addition, the fascicles of the dichotomous and trichotomous branches in *F. annelidica* are longer and these branches lack constrictions at the septa. Therefore, a new combination in *Filospora* is proposed.

Filospora Nawawi, Trans. Brit. Mycol. Soc. 67:
175. 1976.

=*Rogersia* Shearer and Crane, Mycologia 68: 946.
1976.

Filosporella annelidica (Shearer and Crane) Crane
and Shearer, Comb. nov.

=*Rogersia annelidica* Shearer and Crane,
Mycologia 68: 949. 1976. (basionym).

ACKNOWLEDGMENT

We thank Dr. B. C. Sutton, of the Commonwealth
Mycological Institute, for the loan of the type material
of *Filosporella aquatica* and Dr. John Webster for read-
ing the manuscript.

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No. 7. *Rogersia annelidica* gen. sp. nov., an
aquatic Hyphomycete colonizing leaves in the
Sangamon River. *Mycologia* 68: 946-950.

MYCOTAXON

Vol. VI, No. 1, pp. 29-32

July-September 1977

GLOMUS ETUNICATUS SP. NOV.

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Apparently this is a rather common mycorrhizal fungus. It has been observed in wet-sievings of soils from Illinois, Missouri and Florida. Because of the extreme variability of spores with age, at one time we assumed that more than one species was represented. Its developmental morphology was not established until it was obtained in pure "pot culture".

Glomus etunicatus Becker & Gerdemann, sp. nov. Figs. 1-6

Chlamydosporae singillatim in solo vel radicibus emortuis efformatae, globosae vel subglobosae, 68-144 (-162) μ m diametro, leves vel propter tunicae externae dissolutionem atque quisquiliarum adhesionem rugosae. Sporarum cortex 4-13 μ m crassus, ex tunica exteriore ephemera hyalina ad 5 μ m crassa et interiore persistenti lutea vel brunnea laminosa 2-8 μ m crassa compositus. Sporarum maturarum tunica exterior raro intacta, interior maturitate saturescens et laminosa facta. Sporae ad hypham unam vel duas affixae, tunica exteriore brevem partem hyphae proximam includente, et interiore per spatium 30 μ m in hypha extensa et eam incrassante. Sporarum contentus primo ab hypha a septo tenui curvato separatus, maturarum a lamina interiore incrassata.

Chlamydospores formed singly in soil or dead roots, globose to subglobose 68-144 (162) μ m diameter, smooth or roughened from decomposition of the outer wall and adherent debris. Spore wall 4-13 μ m thick, composed of an ephemeral hyaline outer wall up to 5 μ m thick, and a persistent yellow to brown laminate inner wall 2-8 μ m thick. Intact outer wall rarely present on mature spores, inner wall darkening and becoming laminate with age. Spores with one,

rarely two, hyphal attachments. Outer wall extending down attached hypha for a short distance. Attached hypha thickened by extension of inner spore wall for up to 30 μ m. Spore contents separated from attached hypha by a thin curved septum; at maturity, opening occluded by inner wall thickening.

DISTRIBUTION, HABITAT, AND SEASON: Known from a virgin sand prairie in central Illinois and agricultural fields in Illinois, Missouri and Florida. Probably widespread in Eastern United States and present in the soil throughout the year. Spores form abundantly in pot culture after several months.

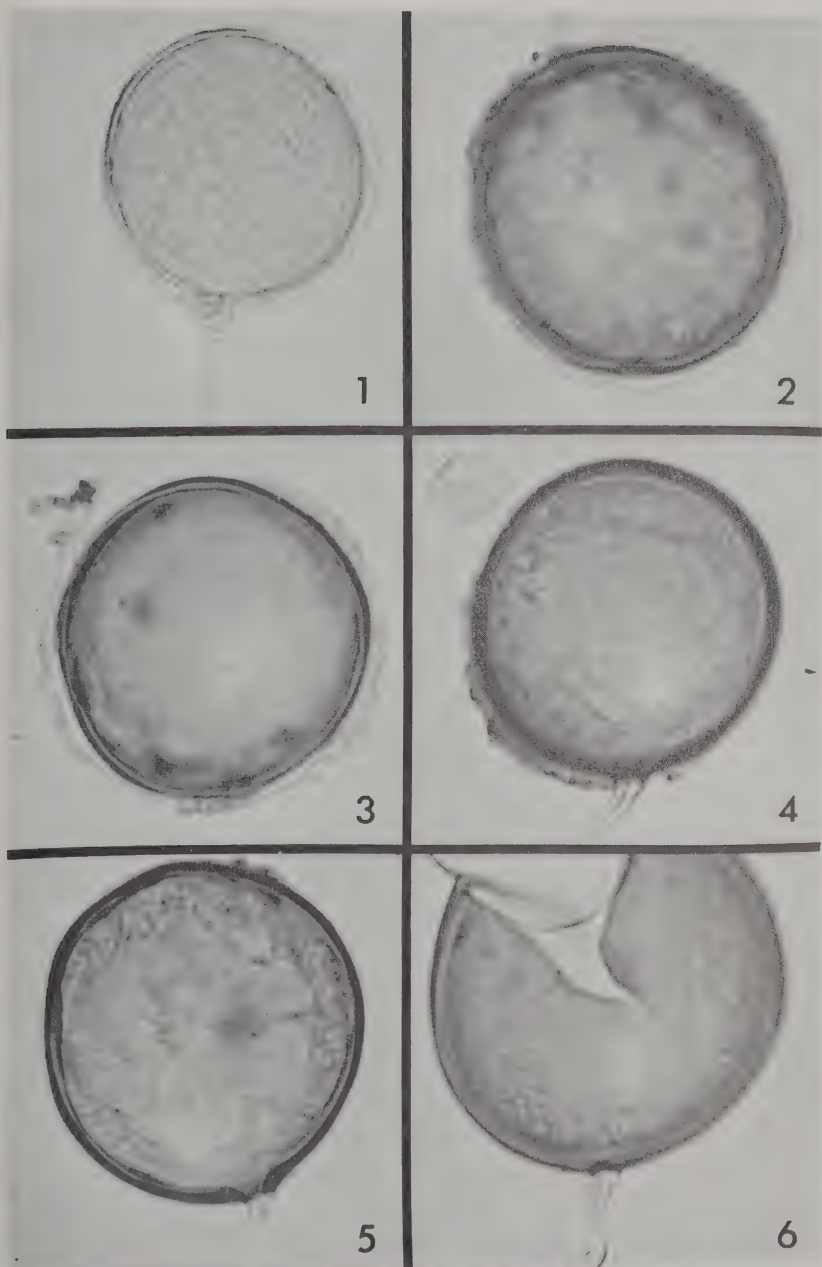
MYCORRHIZAL ASSOCIATIONS: Associated in the field with *Andropogon scoparius* Michx. and *Zea mays* L., forming vesicular-arbuscular mycorrhizae in pot cultures with *Allium cepa* L., *A. sativum* L., *Capsicum frutescens* var. *longum* Sendt., *Gleditsia triacanthos* var. *inermis* Willd., and *Trifolium repens* L.

ETYMOLOGY: Latin, *etunicatus* (deprived of its coat), referring to the ephemeral outer wall.

COLLECTIONS EXAMINED: TYPE: ILLINOIS - Mason Co., State of Illinois Department of Conservation Area, R.9W., T.20N., sections 14 and 23, inoculum from the sand prairie mixed with autoclaved soil and planted with onion, spores were retrieved June 23, 1976, Becker 02 (OSC). PARATYPE: FLORIDA - Orange Co., leg. Stanley Nemec (OSC).

Figures 1-6. *Glomus etunicatus*.

1. Young chlamydospore with intact outer wall, x 378.
2. Chlamydospore with intact outer wall, x 378.
3. Chlamydospore with outer wall beginning to slough off, x 378.
4. Chlamydospore with three-fourths of outer wall gone, x 378.
5. Chlamydospore with only a fragment of the outer wall remaining, x 378.
6. Chlamydospore without an outer wall. Note laminate inner wall and thickening in the attached hyphae, x 378.



Glomus etunicatus can be a very confusing species. The hyaline outer wall quickly decomposes, presumably from the action of soil microorganisms, and it is commonly absent from mature spores. Collections containing only young or only mature spores could easily be presumed to represent two distinct taxa. Spores of intermediate age are necessary in order to establish a relationship between the extremes.

The immature spores of *G. etunicatus* most clearly resemble those formed by *G. caledonium* (Nicol. & Gerd.) Gerd. and Trappe (1974). *G. caledonium* has, however, considerably larger spores (130-279 x 120-272 μm) and a hyaline outer wall which usually is persistent.

The hyphae of *G. etunicatus* are thin-walled and spores tend to break off just below the end of the inner wall thickening in the subtending hypha. Therefore collections of spores wet-sieved from soil very seldom occur in clusters. This serves to distinguish mature spores of *G. etunicatus* from those produced by *G. fasciculatus* (Thaxter) Gerd. & Trappe or *G. macrocarpus* Tul. & Tul. var. *macrocarpus* which because of thick-walled hyphae, tend to occur in clusters when wet-sieved.

Mature spores of *G. etunicatus* might be confused with those of *G. macrocarpus* var. *geosporus* (Nicol. & Gerd.) Gerd. & Trappe, the spores of which also occur singly when wet-sieved from soil. The spores of *G. macrocarpus* var. *geosporus* are darker, larger (110-290 x 100-290 μm), and the wall thickening extends down the attached hypha a much greater distance (50-150 μm).

ACKNOWLEDGEMENTS: This work was supported by funds from the Illinois Agricultural Experiment Station. We wish to thank Dr. D. P. Rogers for preparing the Latin description and Vicki Toews for typing the camera-ready copy.

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MYCOTAXON

Vol. VI, No. 1, pp. 33-42

July-September 1977

NEW GYMNOASCACEAE

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SUMMARY

Two new genera of the Gymnoascaceae, one with two species, are described: *Plunkettomyces littoralis*, *Disarticulatus devroeyi* and *D. indicus*. They are also compared with related genera.

INTRODUCTION

Several strains of gymnoascaceous fungi that differed from known species were isolated from different substrates and geographic areas. A study of these strains indicated that they represented unknown genera and species. They are described here and compared with other members of the family.

Desiccated cultures of the holotype specimen, isotypes, and representative strains of the fungi have been deposited in NY, FH, and CUP. Representative cultures have been deposited in ATCC and NRRL.

TAXONOMY AND DISCUSSION

PLUNKETTOMYCES ORR, GEN. NOV.

Gymnothecia flava usque ad aurantiaca ad aurantio-brunnea, plus minus globosa; elementa extrinsecus e centro vel e basi caespitium ascogenorum radiantia, elongata septata glabra vel tuberculata, flavidula vel subaurantiaca; asci globosi vel ellipsoidei, evanescentes octospori; ascosporae flavo-brunneae vel aurantio-brunneae, lenticulares, per axem longitudinalem costata; status asexualis in forma arthroaleuriosporarum; hyphae ampulliformes praesentes.

Species typicus: *Plunkettomyces littoralis* Orr

Etym: After Dr. O. A. Plunkett, Mycologist, who isolated most of the cultures, and who taught and interested many individuals in the fields of general and medical mycology.

Gymnothecia yellow to orange, more or less globose with elements radiating outward from the center or from the base of the ascal clusters. Elements elongate, septate, smooth to tuberculate, pale yellowish or orangish. Asci globose or ellipsoid, evanescent, 8-spored. Ascospores yellow-brown to orange-brown, lenticular, rimmed on the longitudinal axis. Asexual phase represented by arthroaleuriospores. Racquet (ampulliform) hyphae present. *Plunkettomyces littoralis* Orr, sp. nov.

Fungus homothallicus. Gymnothecia flava usque ad aurantiobrunnea, plus minus globosa, 35-155 μm diam, confluentia; elementa 2.1-3.3 μm lata, extrinsecus e centro vel e basi caespitum ascogenorum radianta, hyalina vel colorata, simplicia vel dichotome ramosa, glabra vel tuberculata; asci globosi 9.5-9.9 μm diam, vel ellipsoidei 7.7-10.3 x 10.3-10.8 μm , hyalini evanescentes octospori; ascosporae flavo-brunneae vel aurantio-brunneae in aspectu fronti circulares, 4.2-5.7 μm diam, costa externa 0.3-0.6 μm lata praeditae, vel lenticulares, a latere visae ad axem longitudinalem vittate, 2.9-3.8 x 4.2-5.6 μm , crassitunicatae glabrae; status asexualis in forma arthroaleuriosporarum plus minus cylindricarum, 2-2.8 x 5-7 μm ; hyphae ampulliformes praesentes non gymnothecia consociates.

Type culture: 0-3053, isolated from a conch shell collected on the beach at April Point, Quadra Island, Vancouver, B. C., Canada. Holotype specimen deposited in NY.

Fungus homothallic. Gymnothecia yellow to orange-brown, more or less globose, 35-155 μm diam, often confluent; elements 2.1-3.3 μm wide radiating outward from the center or the base of the ascal clusters, hyaline or colored, simple or dichotomously branched, smooth or tuberculate. Asci globose, 9.5-9.9 μm diam, or ellipsoid, 7.7-10.3 x 10.3-10.8 μm hyaline, evanescent, 8-spored. Ascospores yellow-brown or orange-brown, circular in face view, 4.2-5.7 μm diam, with an external rim, 0.3-0.6 μm wide, or lenticular in side view with a band on the longitudinal axis, 2.9-3.8 x 4.2-5.6 μm , walls thick, smooth. Asexual phase represented by more or less cylindrical arthroaleuriospores, 2-2.8 x 3.5-7 μm . Racquet hyphae present, not in association with the gymnothecia.

Material examined: (Unless otherwise noted, isolations were made from beached materials or beach soil). Canada: April Point, Vancouver, B. C. - 0-3051, snail shell; 0-3053 (ATCC 34436), conch shell. Mexico: Mazatlan, Sinaloa - 3-3043 (ATCC 34432), kelp; 0-3045, sand; 0-3046, red algae; 0-3050, crab shell; 0-3055, sea anemone, Puerto Vallarta, Sinaloa - 0-3071, sand; 0-3073, crab shell; 0-3076, insect carapace; 0-3078, coral. San Jose Island, Baja California del Sur - 0-3048 (ATCC 34434), 0-3049 (ATCC 34435), clam shells. U. S. A.: Cabrillo Beach, San Diego, California - 0-3024 (ATCC 34431), sand; 0-3044, red algae; 0-3065 (ATCC 34437), limpet shell. Italy: Romagna region - 0-3360 (Varsavsky I-6a, ATCC 34430), soil.

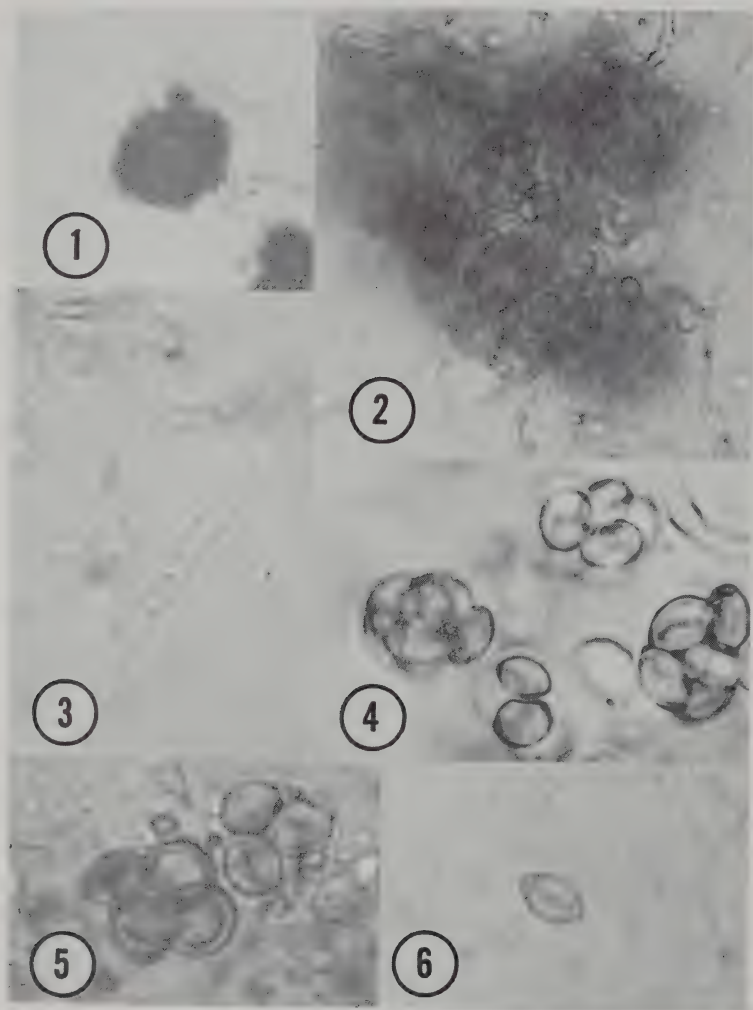
Colonies on Freezing agar (4) or Oatmeal-Salts agar (10) attain a diameter of 70-75 mm in 25-35 days at 30 C. Color of mature colonies may be in buff, dull yellow or yellow-brown shades. Colony reverse is sometimes yellowish. Occasionally, some colorless exudate may be present, but no odor was observed.

Gymnothecia (Fig. 1) are similar to those of *Gymnascella* Peck (8) in general morphology. Peridial elements (Fig. 2) radiate outward from the centrum or the base of the asci. These elements are smooth or coarsely tuberculate (Fig. 3) and taper slightly toward the apices. They may be hyaline, pale yellow, or pale yellow-brown. Gymnothecia of *P. littoralis* also differ from those of *Pseudoarachniotus* Kuehn (8) since the latter has ascocarps composed of loosely interwoven elements (which often disintegrate by maturity) or produces only free ascal clusters.

The ascospores of *P. littoralis* are lenticular with a longitudinal band (Figs. 5, 6) and are similar in morphology to those of *Pseudoarachniotus flavoluteus* (Kuehn & Orr) Orr, Ghosh & Roy (8). The ascospores of the former, however, are yellow-brown to orange-brown and in the latter they are yellow to pale orange. Some ascospores of *P. flavoluteus* may be banded around both axes, a condition not observed on the ascospores of *Plunkettomyces littoralis*. Ascospores in *Gymnascella* are oblate and without adornment rather than lenticular and banded as in *P. littoralis*.

Plunkettomyces littoralis may represent an intermediate between *Gymnascella* and *Pseudoarachniotus*.
DISARTICULATUS ORR, GEN. NOV.

Gymnothecia flavo-aurantia usque ad aurantia, plus minus globosa, elementis saepe inflatis crassitunicatis ad disarticulationem inclinantibus composita; asci globosi vel ellipsoidei evanescentes octospori; ascosporae circulares



Figures 1-6. *Plunkettomyces littoralis*. Fig. 1. Gymnothecium. x 45. Fig. 2. Gymnothecium and individual elements. x 450. Fig. 3. Tuberculate peridial elements. x 950. Fig. 5. ascospores in face view showing external rim. x 1000. Fig. 6. Ascospore in longitudinal view showing rim. x1000.

usque ad ellipticae, protuberatione exiqua laterali praeditae, flavae usque ad aurantiae, crassitunicatae glabrae; status asexualis carens; hyphae ampulliformes praesentes.

Species typica: *Disarticulatus devroeyi* Orr

Etym: To break apart or become disjointed.

Gymnothecia yellow-orange to orange, more or less globose, composed of thick-walled, often inflated elements tending to disarticulate. Asci globose or ellipsoid, evanescent, 8-spored. Ascospores circular to elliptical with a slight lateral bulge, yellow to orange, walls thick, smooth. Asexual phase absent. Racquet hyphae present.

Disarticulatus devroeyi Orr, sp. nov.

Fungus homothallicus. Gymnothecia flavo-aurantia usque ad aurantia, plus minus globosa 30-175 μm diam, cellulis in forma variabilibus 3.8-13.3 μm latis, crassitunicatis (0.6-1.4 μm), libenter disarticulantibus composita, cellulis aliquis gymnothecialibus e sulcis internis annularibus lineatis; asci globosi, 9.5-15 μm diam vel ellipsoidei, 9.1-9.5 x 11.4-12.3 μm , hyalini evanescentes octospori; ascosporae flavo-aurantiae usque ad aurantiae, in aspectu frontali circulares 5.9-7.6 μm diam vel ellipticae longitudinaliter visae protuberatione laterali exigua praeditae, 3.4-3.8 x 3.8-5.9 μm , crassitunicatae glabrae; sporae asexual iscaerentes; hyphae ampulliformes praesentes, gymnothecia non consociatae.

Type culture: 0-3485, from soil, Republic of Somalia.

Holotype specimen deposited in NY.

Fungus homothallic. Gymnothecia yellow-orange to orange, more or less globose, 30-175 μm diam. Components of the gymnothecia of variously shaped cells, 3.8-13.3 μm wide, with thick walls, 0.6-1.4 μm tending to disarticulate readily; some individual cells of the gymnothecia lined with annular grooves on the interior. Asci globose, 9.5-15 μm diam, or ellipsoid, 9.1-9.5 x 11.4-12.3 μm , hyaline, evanescent, 8-spored. Ascospores yellow-orange to orange, circular in face view, 4.9-7.9 μm diam, or elliptical with a slight lateral bulge in side view, 3.4-3.8-3.8-5.9 μm , walls thick, smooth. Asexual phase absent. Racquet hyphae present, not in association with the gymnothecia.

Material examined: All strains were isolated from soil, Republic of Somalia by Dr. C. Devroey, Institut de Médecine Tropicale Prince Léopold, Antwerp, Belgium. 0-3167 (RV 20001), 0-3185 (RV 19811), 0-3475 (RV 19863), 0-3476 (RV 19864), 0-3485 (RV 19682, NRRL 5543, ATCC 34425, UAMH 4018), 0-3489 (RV 20002, ATCC 34426), 0-3490 (RV 19653).

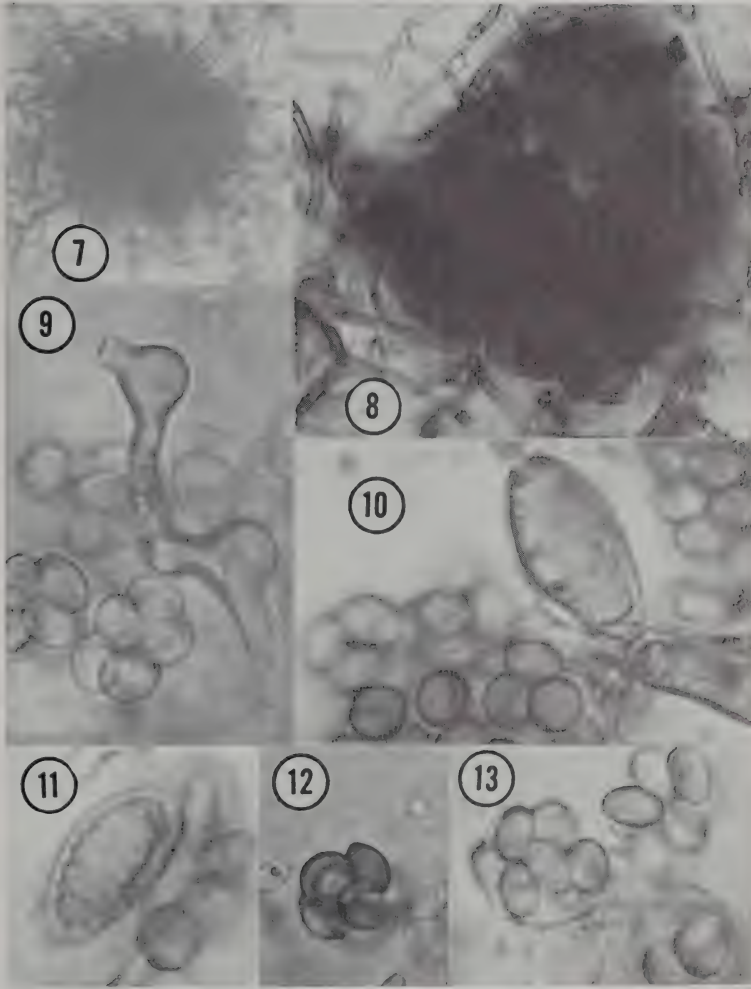
Colonies of *D. devroeyi* on freezing agar (4) and Oatmeal-Salts agar (10) attain a diameter of 75-80 mm in 25-30 days at 30 C. Colonies are at first white, becoming yellowish to yellow-green and finally orange, orange-brown or cinnamon in age. Colony reverse is frequently reddish-brown. A red exudate is sometimes present, but no odor was observed.

Discrete gymnothecia (Figs. 7, 8) are composed of large, thick-walled elements (Figs. 9, 10) that tend to disarticulate readily, resembling *Shanorella* Benjamin (1). Some of these peridial elements have distinct interior annular grooves (Figs. 10, 11). This character has not been observed in the peridial elements of any other gymnoascaceous species. The peridial elements are otherwise similar to those of *Petalosporus nodulosus* Ghosh, Orr & Kuehn (3). *Petalosporus* Ghosh, Orr & Kuehn (3) was described originally as having a rudimentary peridium. Additional observations on numerous strains of two of the three *Petalosporus* species demonstrate that the peridium is not as rudimentary as originally described (Fig. 14).

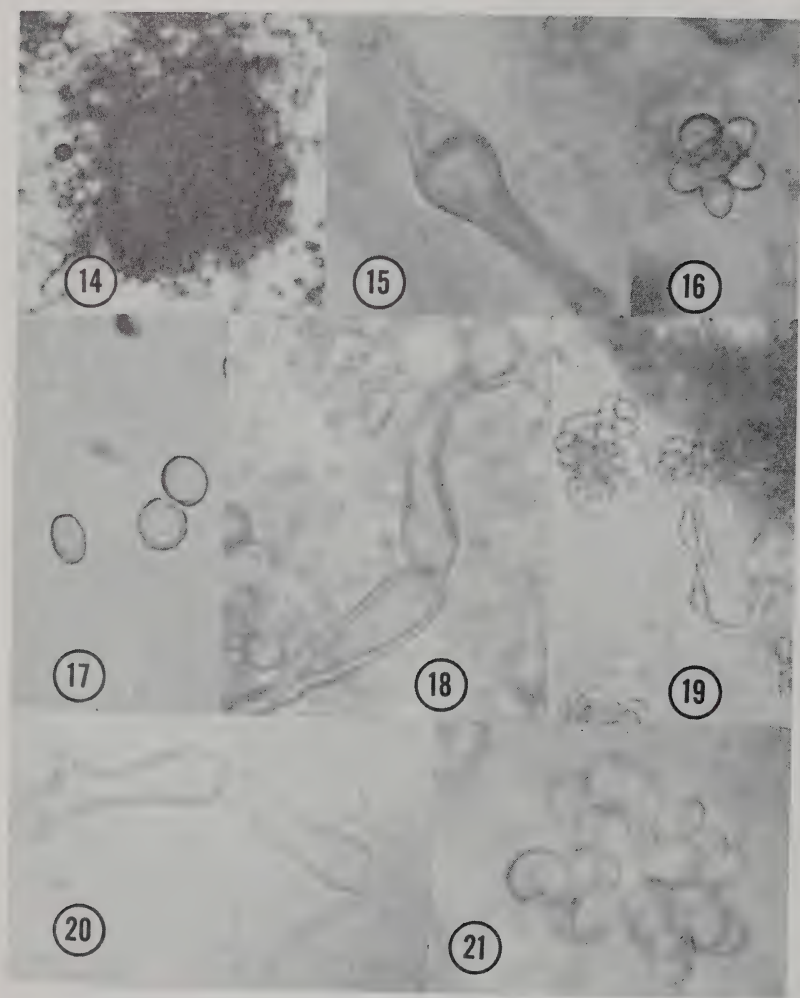
Ascospores of *D. devroeyi* are circular in face view (Fig. 12) and elliptical in longitudinal view (Fig. 13). In shape, they are similar to ascospores of *Gymnoascus* Baran., *Gymnascella* and other gymnoascaceous species listed by Orr (6) and Orr et al. (8, 9). Padhye and Carmichael (10) have described similar ascospores in *Arthroderma* Berkeley and *Nannizzia* Stockdale as "oblate spheroids." The ascospores of *D. devroeyi* resemble those of species of *Petalosporus* (3, 5, 7) since slight lateral bulges (Figs. 13, 17) are present in both. The isolates representing *D. devroeyi* were provisionally identified as *Petalosporus* sp. by DeVroey (2). The disposition of ascospores in the ascus in a petaloid arrangement in *Petalosporus* species is lacking in *D. devroeyi* (Figs. 12, 13). *Disarticulatus* and *Petalosporus* are probably related.

Disarticulatus indicus Orr, sp. nov.

Fungus homothallicus. Gymnothecia flava usque ad aurantia, plus minus globose, 225-625 μm diam, confluentia; elementa gymnothecialia e cellulis in forma variabilibus 6.3-15 μm latis crassitunicatus (0.6-1.3 μm) ad disarticulationem inclinatis composita; asci globosi 9-12.9 μm vel ellipsoidei 8.6-12.1 x 10.8-16.3 μm , hyalini evanescentes octospori; ascosporae flavo-brunneae usque ad aurantio-brunneae, in aspectu frontali circulares 4-6.4 μm diam, vel ellipticae, longitudinaliter visae protuberatione laterali exigua praeditae, 3.6-5.7 (7.6) x 5.9-7.6 (11.4)



Figures 7-13. *Disarticulatus devroeyi*. Fig. 7. Gymnothecium. x100. Fig. 8. Gymnothecium and peridial elements. x450. Fig. 9. Swollen peridial elements. x1000. Fig. 10. Enlarged elements with thick walls. x1000. Fig. 11. Enlarged elements showing interior grooves. x1000. Fig. 12. Ascospores within an ascus. x950. Fig. 13. Ascospores. Note lateral bulges. x1000.



Figures 14-16. *Petalosporus nodulosus*. Fig. 14. Gymnothecium. x450. Fig. 15. Thick walled peridial elements with swellings. x1000. Fig. 16. Ascospores in petaloid arrangement. x950. Figures 17-18. *Petalosporus anodosus*. Fig. 17. Ascospores. Note lateral bulge. x1000. Fig. 18. Peridial elements. x1000. Figures 19-21. *Disarticulatus indicus*. Fig. 19. Peridial elements. x450. Fig. 20. Peridial elements. x1000. Fig. 21. Asci and ascospores. x1000.

μm , crassitunicatae glabrae; status asexualis carens; hyphae ampulliformes gymnotheciis consociatae praesentes. Type culture: 0-1130, from soil, Calcutta, West Bengal, India. Holotype specimen deposited in NY.

Fungus homothallic. Gymnothecia yellow to orange, more or less globose, 225-625 μm diam, often confluent; elements composing the gymnothecia of variously shaped cells, 6.3-15 μm wide, with thick walls (0.6-1.3 μm), tending to disarticulate. Asci globose, 9-12.9 μm diam, or ellipsoid, 8.6-12.1 x 10.8-16.3 μm , hyaline, evanescent, 8-spored. Ascospores yellow-brown to orange-brown, circular in face view, 4-6.3 μm diam, or slliptical with a slight lateral bulge in longitudinal view, 3.6-5.7 (7.6) x 5.9-7.6 (11.4) μm , walls thick, smooth. Asexual phase absent. Racquet hyphae present, in association with the gymnothecia.

Material examined: India: Bhubaneswar, Orissa - 0-951 (ATCC 34427), guinea pig dung. Puri, Orissa - 0-1069 (Ghosh GR-15), bat dung. Calcutta, West Bengal (?) - 0-1130 (Gugnani S 399, ATCC 34428), from soil; 0-1131 (Gugnani S 400, ATCC 34429), from soil.

Colonies of *D. indicus* on Freezing agar (4) and Oatmeal-Salts agar (10) attain a diameter of 80-85 mm in 25-30 days at 30 C. Colonial felt may be in yellow-orange, orange or cinnamon shades on those media, but little aerial mycelium is present. Colony reverse may be orange or brownish. Cultures produce a slightly musty odor, but no exudate was observed.

Gymnothecia (Fig. 14) and peridial elements (Figs. 19, 20) are somewhat similar to those produced by *Petalosporus anodosus* Kuehn, Orr & Ghosh (Fig 18). These similarities also suggest a relationship between *Disarticulatus* and *Petalosporus*.

Ascospores of *D. indicus* (Fig. 21) are similar in morphology to those of *Petalosporus* (Fig 17) since they are circular in face view and elliptical in longitudinal view. In addition, ascospores have slight lateral bulges (Fig. 21). However, the petaloid arrangement of the ascospores in the asci in species of *Petalosporus* is lacking in *D. indicus*.

Keys to some genera and species of the Gymnoascaceae was prepared by Orr (6) and Orr et al. (9).

ACKNOWLEDGEMENTS

Thanks are due Dr. O. A. Plunkett, Dr. C. DeVroey and

Dr. G. R. Ghosh who provided the cultures. Ms. Bobbie Keck, Photographic Branch, U.S. Army Dugway Proving Ground, provided the photographic work. Dr. E. Cash, Binghamton, New York, provided the Latin diagnoses. I also wish to thank those who provided critiques for the manuscript and Mrs. B. Sue Smith for technical assistance.

This work was supported by USATECOM In-House Independent Research Project No. 9-CO-043-005-045 through U. S. Army Dugway Proving Ground.

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MYCOTAXON

Vol. VI, No. 1, pp. 43-77

July-September 1977

SYNOPSIS OF WOOD-ROTTING FUNGI ON SPRUCE IN NORTH AMERICA:¹

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SUMMARY

One hundred and twenty-nine species of wood-rotting basidiomycetes in the family Corticiaceae are reported to occur on 8 species of North American spruces. The new combinations *Hyphoderma ludoviciana*, *Hyphoderma resinosum*, and *Hyphoderma terricola* are proposed.

The genus *Picea* A. Dietr. is represented in North America by 9 species commonly known as spruces. These are *Picea breweriana* S. Wats. (Brewer spruce), *P. engelmannii* Parry (Engelmann spruce), *P. glauca* (Moench.) Voss (white spruce), *P. mariana* (Mill.) B. S. P. (black spruce), *P. pungens* Engelm. (blue spruce), *P. rubens* Sarg. (red spruce), *P. sitchensis* (Bong.) Carr. (Sitka spruce), *P. chihuahuana* Martinez (Chihuahua spruce), and *P. mexicana* Martinez (Mexican spruce). Spruces occur in cool north temperate regions of North America and two occur at high elevations in Mexico.

Brewer spruce is limited to a few localities in southwestern Oregon and northern California and is of little commercial importance. Engelmann spruce occurs in the

¹/ University of Arizona Agricultural Experiment Station
Journal Article No. 2713.

Rocky Mountain region from southern Arizona to central Alberta and British Columbia and in the Cascade Mountain forests and is an important timber tree. White spruce is a widely distributed tree ranging from Newfoundland across Canada and nearly to the western coast of Alaska. It occurs in the United States in the Northeast, the Great Lakes region, western Montana, and the Black Hills of South Dakota and Wyoming. White spruce is important for saw timber and pulpwood. Black spruce has a distribution in Canada and Alaska similar to that of white spruce and extends into the United States in the Northeast and Great Lakes region. It is important for pulpwood.

Blue spruce occurs in the central Rocky Mountains from southern Idaho and Wyoming to Arizona and New Mexico. It is a minor timber species. Red spruce is distributed from Labrador to the Great Smoky Mountains of North Carolina and Tennessee. It is important for timber and pulpwood, especially in the maritime provinces of Canada and the northeastern United States. Sitka spruce occurs only along the Pacific Coast from southern Alaska to northern California. It is the largest North American spruce and is an important timber tree. Chihuahua spruce has a limited distribution in the mountains of Chihuahua, and Mexican spruce occurs only in the mountains around Saltillo, Coahuila. Detailed information on the distribution and silvical characteristics of the spruces is in publications by Fowells (1965) and Little (1971) and in Harlow and Harrar's textbook of dendrology (1958). For information on the Mexican spruces, see Martinez (1963).

This is the first part of an intended three part synopsis of wood-rotting fungi that have been found on the spruces in North America. The fungi include both those collected by the authors and those reported in literature. Host indices including records of wood-rotting fungi on North American spruces are those of Magasi (1966), Lowe (1969), Shaw (1973), Gilbertson, Martin, and Lindsey (1974), the USDA host index (1960), and Connors (1967).

Part 1 includes keys to the orders of lignicolous Basidiomycetes, keys to the families of the Aphyllophorales, and keys to the subfamilies, genera, and species of the Corticiaceae.

Pertinent descriptive characters not included in the keys, the species of spruce on which each fungus occurs,

geographical locality, and type of rot produced (if known) follow each fungal species. If only one species of a genus has been found on spruce, the species is included in the generic key.

We have no reports of wood-rotting fungi on *P. mexicana*. Numbers used to designate the other species of spruce in the text are as follows: 1. *P. breweriana*; 2. *P. engelmannii*; 3. *P. glauca*; 4. *P. mariana*; 5. *P. pungens*; 6. *P. rubens*; 7. *P. sitchensis*; 8. *P. chihuahuana*; 9. *Picea* sp. Abbreviations designating geographical localities are: AK, Alaska; AZ, Arizona; AT, Alberta; BC, British Columbia; CA, California; CO, Colorado; CH, Chihuahua; CT, Connecticut; ID, Idaho; MB, Manitoba; ME, Maine; MN, Minnesota; MT, Montana; NB, New Brunswick; NF, Newfoundland; NH, New Hampshire; NM, New Mexico; NWT, Northwest Territories; NS, Nova Scotia; NY, New York; OR, Oregon; OT, Ontario; PA, Pennsylvania; PEI, Prince Edward Island; QB, Quebec; SK, Saskatchewan; UT, Utah; VT, Vermont; WA, Washington; WS, Wisconsin; WY, Wyoming; YT, Yukon Territory.

Key to the Orders of Lignicolous Basidiomycetes

1. Basidia septate, bifurcate, or with stout epibasidia
 TREMELLALES
1. Basidia not septate, not bifurcate, and without
 stout epibasidia. 2
2. Hymenophore in form of radial lamellae;
 basidiocarps mostly fleshy, deteriorating
 rapidly after maturity. AGARICALES
2. Hymenophore smooth, hydnaceous, folded, in
 the form of united tubes or erect flattened
 branches; if lamellate, then basidiocarps
 tough, corky and not deteriorating rapidly
 APHYLLOPHORALES

Key to Families of APHYLLOPHORALES

1. Tissue brown, permanently darkening in KOH solution;
 clamp connections absent; setae present or absent.
 HYMENOGYNETACEAE
1. Tissue white to light or bright colored, if
 brownish not permanently darkening in KOH solution;
 clamps present or absent, setae not present . . . 2

2. Hyphae pigmented, loosely arranged; basidiospores pigmented, echinulate to verrucose or strongly warted. THELEPHORACEAE
2. Hyphae hyaline or pigmented, loosely to compactly arranged; basidiospores hyaline or pigmented, smooth with few exceptions. . . 3
3. Basidiocarps with hymenophore in form of united tubes POLYPORACEAE
3. Basidiocarps not as above 4
4. Basidiocarps with hymenium on erect branched or simple lobes 5
4. Basidiocarps not as above 6
5. Basidiocarps much branched with hymenium on surface of anastomosing petal-like lobes . SPARASSIDACEAE
5. Basidiocarps with simple, erect lobes or, if branched, lobes not petaloid. CLAVARIACEAE
6. Basidiospores brown to yellowish, dextrinoid or not in Melzer's reagent. CONIOPHORACEAE
6. Basidiospores hyaline or faintly pigmented, amyloid, dextrinoid or negative in Melzer's reagent 7
7. Dextrinoid hyphidia present LACHNOCLADIACEAE
7. Dextrinoid hyphidia absent. 8
8. Basidiocarps woody, perennial; basidiospores amyloid; thick-walled, incrustated cystidia present ECHINODONTIACEAE
8. Not with the above combination of characters. 9
9. Basidiospores amyloid; gloeoplerous hyphae present HERICEACEAE
9. Basidiospores amyloid or not; gloeoplerous hyphae not present. 10
10. Hymenophore toothed or smooth; hyphal system dimitic with thick-walled incrustated cystidia. STECCHERINACEAE
10. Hymenophore smooth or merulioid; if toothed, hyphal system not dimitic 11
11. Hymenophore merulioid; hymenium developed on the ridges and absent between them. PUNCTULARIACEAE
11. Hymenophore and hymenium not as above 12
12. Basidiocarps effused-reflexed to sessile STERACEAE
12. Basidiocarps resupinate CORTICIACEAE

Family CORTICIACEAE

Key to subfamilies

1. Subicular hyphae large, up to 8-10 μm diam with distinctive right angle branching; lacking thick-walled, incrusted cystidia. .BOTRYOBASIDIOIDEAE Parm.
1. Subicular hyphae smaller, usually 2-6 μm diam, usually without distinctive right angle branching, or with thick-walled incrusted cystidia 2
 2. Basidia globose or subglobose to urniform or if clavate then hyphae ampullate at the septa. . .SISTOTREMOIDEAE J. Erikss. emend. Parm.
 2. Basidia narrowly to broadly clavate or utriform, hyphae not ampullate at septa 3
3. Basidia utriform, arising from imbedded basidioles, developing in a catathymenium ALEURODISCOIDEAE (Pil.) Parm.
3. Basidia not utriform, developing in a typical euhymenium. 4
 4. Hymenophore smooth; cystidia thick-walled, mostly with a thin-walled apical bulb, usually rooted, dissolving in 10% KOH; if cystidia absent, rooted basidia present TUBULICRINIOIDEAE Parm.
 4. Hymenophore smooth; hydnaceous, merulioid, or poroid; cystidia if present not rooted, and usually not dissolving in KOH; basidia not rooted. 5
5. Gloeocystidia present; basidiospores weakly to strongly amyloid GLOEOCYSTIDIELLOIDEAE Parm.
5. Gloeocystidia present or absent, if present, basidiospores not amyloid 6
 6. Subicular hyphae usually gelatinizing, not readily separable PHLEBIOIDEAE J. Erikss. emend. Parm.
 6. Subicular hyphae usually distinct, not gelatinizing (see also *Dacryobolus*). 7
7. Lower subiculum with a layer of loosely arranged basal hyphae parallel to substratum; hymenial layer usually forming a distinct pellicle ATHELIOIDEAE Parm.
7. Basal hyphae rarely parallel to substratum, hymenial layer appearing tomentose or pilose, not pelliculose . .HYPHODERMOIDEAE J. Erikss. ex Parm.

Subfamily ALEURODISCOIDEAE

Key to Genera

1. Basidiospores amyloid; acanthophyses or paraphysoid hyphae present; gloecystidia present in most species *Aleurodiscus* Rabenh. ex J. Schroet.
1. Basidiospores not amyloid; acanthophyses and gloecystidia not present . *Aleurocystidiellum* Lemke

Aleurocystidiellum subcruentatum (Berk. et Curt.) Lemke. Basidiocarps discoid to subpileate, cream-buff; hyphal system dimitic, generative hyphae with clamps; incrustated paraphysoids abundant; basidiospores ovoid to broadly ellipsoid, verruculose, 15-18 x 11-15 μ m. On 3 in QB; 6 in NH, NY; 7 in AK, CA, OR, WA; 9 in NS, OT.

Key to Species of *Aleurodiscus*

1. Basidiospores echinulate. 2
1. Basidiospores smooth. 5
 2. Basidiocarps corticioid 3
 2. Basidiocarps discoid

Aleurodiscus amorphus (Pers. ex Fr.) J. Schroet. Hymenial surface orange-buff to rosaceous-buff; hyphae simple-septate; moniliform paraphysoid hyphae present between basidia, not projecting; basidiospores subglobose to ovoid, 20-26 x 16-20 μ m. White rot on 3 in AT; 5 in CO, ID; 7 in CA, OR; 9 in CO.

3. Basidiospores less than 15 μ m long and 14 μ m wide 4
3. Basidiospores 15-20 x 14-18 μ m

Aleurodiscus penicillatus Burt. Basidiocarps in small crust-like patches; hymenial surface light-buff to cream-buff; hyphae with clamps; moniliform or mammillate gloecystidia abundant; acanthophyses cylindrical to clavate, with acicular projections towards the apex; basidiospores globose to subglobose. White rot on 3 in QB; 6 in NH; 7 in BC, OR.

4. Basidiospores 5-7 x 5-6 μm

Aleurodiscus weirii Burt. Hymenial surface white when fresh, aging cream to Cartridge Buff; hyphae with clamps; acanthophyses cylindrical, with aculeate projections at the apex; basidiospores subglobose. White rot on 7 in AK.

4. Basidiospores 8-10 x 8-9 μm

Aleurodiscus laurentianus Jacks. et Lemke. Hymenial surface white when fresh, drying creamy to tan; hyphae with clamps; acanthophyses cylindrical to subrectangular, aculeate projections lateral or apical or both; basidiospores globose to subglobose. On 4 in QB.

5. Basidiospores ellipsoid to subglobose, over 10 μm long and 7 μm wide 6
 5. Basidiospores cylindric, 6-8 x 3-4 μm

Aleurodiscus lividocoeruleus (Karst.) Lemke. Basidiocarps widely effused; hymenial surface cream colored to dark bluish gray; hyphae with clamps; gloecystidia imbedded or projecting, often moniliform or mammillate; acanthophyses subclavate, aculeate over apical portion. White rot on 2 in AZ, CO, UT; 3 in AK, YT; 4 in OT; 9 in AT, BC, MT, NF, OT, QB.

6. Basidiocarps orbicular with determinate margins; hyphae simple-septate 7
 6. Basidiocarps corticioid; hyphae with clamps

Aleurodiscus canadensis Skolko. Basidiocarps in small adnate patches, pruinose, pale brownish; gloecystidia abundant, mostly imbedded; acanthophyses strongly aculeate, often swollen at the base; branched paraphysoids present; basidiospores ellipsoid, 17-22 x 10-14 μm . White rot on 3 in OT, QB; 9 in OT, QB.

7. Basidiospores 17-20 x 13-25 μm

Aleurodiscus piceinus Lyon et Lemke. Hymenial surface drying ochraceous buff with rosaceous and cinereous tints; margin whitish; gloecystidia embedded,

mammillate; acanthophyses cylindrical to clavate, aculeate on the upper half; basidiospores ovoid to ellipsoid. On 6 in NH, QB, VT; 9 in OT.

7. Basidiospores 12-15 x 7.5-9 μ m

Aleurodiscus fennicus Laur. Hymenial surface pale gray to grayish rose; margin somewhat reflexed, white; gloeocystidia cylindrical, embedded; acanthophyses cylindrical to subclavate, acicular projections on the upper one-third to two-thirds; basidiospores ovoid to ellipsoid. White rot on 6 in NH, NY, QB.

Subfamily ATHELIOIDEAE

Key to Genera

1. Basidiospores dextrinoid or amyloid in Melzer's reagent 2
 1. Basidiospores negative in Melzer's reagent. 3
 2. Hymenial surface merulioid; basidiospores ellipsoid, dextrinoid . . . *Leucogyrophana* Pouz.
 2. Hymenial surface smooth; basidiospores narrowly ellipsoid to cylindric, amyloid *Amylocorticium* Pouz.
 3. Hymenial surface merulioid when fresh, usually remaining merulioid on drying. 4
 3. Hymenial surface smooth when fresh, or if merulioid then becoming smooth on drying. 5
 4. Hymenial surface buff to pinkish or reddish; basidiospores hyaline in KOH. *Byssomerulius* Parm.
 4. Hymenial surface orange-yellow; basidiospores pale yellowish in KOH. . . . *Plicatura* Pk.
- Plicatura aurea* (Fr.) Parm. Basidiocarps radiately plicate; hyphae with clamps; basidiospores cylindric to sub-allantoid, 3.5-4.5 x 1.5-2 μ m. Brown rot on 2 in MT; 3 in BC.
5. Hymenial layer pellicular, on a soft, arachnoid subiculum; cystidia absent. *Athelia* Pers. emend. Donk
 5. Hymenial layer waxy to tomentose or arid, or if pellicular, then conspicuous cystidia present . . . 6

6. Subicular hyphae mostly simple-septate, but most species with some double or single clamps; basidiospores cylindric
 *Phanerochaete* Karst. emend. Donk
6. Subicular hyphae strictly with clamps;
 basidiospores triangular. *Tylospora* Donk

Key to Species of *Amylocorticium*

1. Basidiospores narrowly cylindric, slightly curved

Amylocorticium subsulphureum (Karst.) Parm. Hymenial surface yellowish to cream colored; hyphae with clamps; cystidia cylindric, abundant; basidiospores 5-6.5 x 1.5-2 μ m. White rot of 2 in MT; 9 in AT.

1. Basidiospores narrowly ellipsoid, flattened on one side

Amylocorticium subincarnatum (Pk.) Pouz. Hymenial surface yellow to cinnamon yellow; margin minutely fibrillose; hyphae with clamps; cystidia cylindric, abundant, sometimes with a clamp; basidiospores 4-5.5 x 2-2.5 μ m. White rot on 2 in AZ; 3 in BC, MN; 9 in AT.

Key to Species of *Athelia*

1. Hyphae mostly simple-septate, some with rare clamps. 2
1. Hyphae mostly with clamps 5
 2. Basidiospores ellipsoid, or subglobose to ovoid, not over 4 μ m long 3
 2. Basidiospores ellipsoid, to 8 μ m long.

Athelia decipiens (Hoehn. et Litsch.) J. Erikss. Hymenial surface white to grayish, cracking on drying; basidiospores 4-6 (-8) x 2-3 μ m. White rot on 2 in CO, UT.

3. Rhizomorphs absent or not bright yellow 4
3. Bright yellow rhizomorphs at margin and in substratum

Athelia bicolor (Pk.) Parm. Hymenial surface smooth, whitish to yellowish buff; subiculum bright yellow; basidiospores ellipsoid to ovoid, $3-4 \times 2-3 \mu\text{m}$. On 3 in AK, BC; 9 in AT, CO, QB.

4. Hymenial surface often warted or with circular depressions; white rhizomorphs often present

Athelia byssina (Karst.) Parm. Hymenial surface cream or splotched with golden yellow; basidiospores ovoid to subglobose, $3-4 \times 2-3 \mu\text{m}$. White rot on 2 in AZ, MT; 3 in MN, NWT; 9 in AT.

4. Hymenial surface smooth; rhizomorphs absent

Athelia reticulata (Litsch.) Parm. Hymenial surface cream colored; basidiospores broadly ellipsoid, $3-4 \times 2-3 \mu\text{m}$. White rot on 2 in AZ.

5. Hymenial layer whitish to buff; subiculum concolorous or paler 6
5. Hymenial layer cream to buff on a pale brown subiculum

Athelia fuscostrata (Burt) Donk. Margin sometimes rhizomorphic; basidiospores ellipsoid to short cylindric, flattened on one side, $3-4 \times 2-2.5 \mu\text{m}$. White rot on 2 in AZ, BC.

6. Basidiospores over $4.5 \mu\text{m}$ long. 9
6. Basidiospores $4.5 \mu\text{m}$ long or less 7
7. Cystidia absent 8
7. Cystidia present

Athelia munda (Jacks. et Deard.) M. P. Chris. Cystidia cylindric, slightly thick-walled, $30-40 \times 3-4 \mu\text{m}$; basidiospores narrowly ellipsoid to fusiform, $3-4 \times 2-2.5 \mu\text{m}$. White rot on 2 in AZ.

8. Hymenial layer cream to pale buff; basidiospores $2.5-3 \times 2-2.5 \mu\text{m}$

Athelia microspora (Karst.) Gilbn. Subicular hyphae often incrustated with small granules and appearing rough. White rot on 5 in CO; 9 in AT.

8. Hymenial layer whitish with a bluish tint;
basidiospores $3-4.5 \times 2-3 \mu\text{m}$

Athelia galzinii (Bourd.) Donk. Basidiospores cylindric-ellipsoid. White rot on 2 in CO, MT; 3 in YT; 9 in QB.

9. Basidiospores ellipsoid to cylindric or obliquely pyriform 10
9. Basidiospores obovate to subglobose

Athelia neuhoffii (Bres.) Donk. Hymenial layer whitish to cream yellow; basidiospores $5.5-7.5 \times 3.5-5 \mu\text{m}$. White rot on 3 in AK; 9 in AT, QB.

10. Basidiospores cylindric, length greater than twice the width 11
10. Basidiospores ellipsoid or obliquely pyriform, length less than twice the width

Athelia tessulata (Cke.) Donk. White rhizomorphs present; basidiospores with large apiculus, $4.5-5 \times 2.5-3 \mu\text{m}$. White rot on 3 in BC.

11. Hymenial surface light buff to ochraceous buff, shallowly merulioid

Athelia septentrionalis J. Erikss. Rhizomorphs absent; basidiospores cylindric, $6-6.5 \times 2 \mu\text{m}$. White rot on 2 in AZ; 3 in AK.

11. Hymenial surface with a faint tint of rose, smooth

Athelia borealis (Rom.) Parm. Rhizomorphs present in subiculum and marginal tissue; basidiospores cylindric to fusiform, slightly curved, $4-6 \times 2-2.5 \mu\text{m}$. White rot on 3 in BC; 4 in AT; 9 in BC.

Key to Species of *Byssomerulius*

1. Hyphae simple-septate 2
1. Hyphae with clamps 3
2. Cystidia present

Byssomerulius hirtellus (Burt) Parm. Hymenial surface pinkish buff to cream colored or cinereous

when dry; subiculum white; cystidia hyphoid, cylindric; basidiospores cylindric to slightly allantoid, 4-5 x 1.5-2 μm . White rot on 2 in AZ, CO, UT; 6 in NY.

2. Cystidia absent

Byssomerulius corium (Fr.) Parm. Hymenial surface reticulately poroid, pale buff to dark cinnamon brown; basidiospores subcylindrical, 4-6 x 1.5-2.5 μm . White rot on 4 in MN.

3. Hymenial surface pale buff to yellowish; rhizomorphs usually present

Byssomerulius serpens (Fr.) Parm. Basidiospores short-cylindric, 4-5 x 1.5-2 μm . White rot on 2 in AZ; 9 in AT.

3. Hymenial surface buff to olive brownish or yellowish; rhizomorphs not present

Byssomerulius incarnatus (Schw.) Gilbn. et Budington. Basidiospores cylindric, 5-7 x 2.5-3.5 μm . White rot on 9 in AT.

Key to Species of *Leucogyrophana*

1. Hymenial surface olivaceous, yellow to pinkish orange, merulioid to smooth or grandinioid . . . 2
1. Hymenial surface brown, becoming hydneous or raduloid in appearance

Leucogyrophana pinastri (Fr.) Ginns et Weresub. Hyphae with clamps or simple-septate; basidiospores 4.5-7 x 3-5 μm . Brown rot on 2 in AZ; 7 in AK.

2. Hymenial surface yellow to pinkish orange, shallowly to strongly merulioid 3
2. Hymenial surface mustard color to olivaceous; hyphoid cystidia present; associated with sclerotia

Leucogyrophana olivascens (Berk. et Curt.) Ginns et Weresub. Hyphae with clamps; basidiospores 4-6.5 x 3-4 μm . On 5 in CO.

3. Basidiocarps thin, delicate, pelliculose; hymenial surface drying bright yellowish to orange

Leucogyrophana mollusca (Fr.) Parm. Basidia 25-28 x 4-5 μm ; basidiospores 4.5-6 x 3.5-4.5 μm . White rot on 2 in MT; 7 in AK; 9 in AT.

3. Basidiocarps becoming thick and fleshy; hymenial surface pinkish orange when fresh, drying cream buff to dark reddish brown

Leucogyrophana pseudomollusca (Parm.) Parm. Basidia 27-30 x 5-8 μm ; basidiospores 7-9 x 4-5 μm . Brown rot on 2 in MT.

Key to Species of *Phanerochaete*

- | | |
|---|---|
| 1. Hymenial surface yellowish to mustard color . . . | 2 |
| 1. Hymenial surface buff to whitish or cinereous or with reddish tints. | 3 |
| 2. Hymenial surface yellowish; cystidia heavily incrustated | |

Phanerochaete sulphurina (Karst.) Budington et Gilbn. Basidiocarps becoming pale brownish on drying and cracking extensively to expose bright yellow subiculum in the cracks; yellow rhizomorphs present; cystidia usually imbedded; basidiospores short cylindric, slightly curved, 4-4.5 x 2-2.5 μm . White rot on 9 in AT.

2. Hymenial surface yellowish to mustard color, cystidia not incrustated.

Phanerochaete carnosa (Burt) Parm. Yellow rhizomorphs present; cystidia abundant, often septate, tapering to the tip; basidiospores short-cylindric, 4-5 x 2-2.5 μm . White rot on 2 in AZ; 4 in NF.

- | | |
|--|---|
| 3. Cystidia abundant, usually incrustated. | 4 |
| 3. Cystidia occasional, not incrustated | |

Phanerochaete sanguinea (Fr.) Parm. Hymenial surface varying from cream to red or salmon, often rhizomorphic; cystidia fusiform; basidiospores ellipsoid, flattened on one side, 5-6 x 2-2.5 μm . White rot on

9 in QB.

4. Lower subiculum loosely arranged; cystidia thin-walled, usually lightly incrustated

Phanerochaete cremea (Bres.) Parm. Hymenial surface white to light buff; cystidia cylindric to bluntly fusoid, capitately incrustated; basidiospores cylindric, 6-7.5 x 2-2.5 μm . White rot on 3 in BC; 9 in CO.

4. Lower subiculum compactly arranged; cystidia thick-walled, heavily incrustated

Phanerochaete velutina (DC. ex Fr.) Parm. Hymenial surface pinkish buff or vinaceous buff; margin often with whitish rhizomorphs; cystidia cylindric; basidiospores short-cylindric, slightly curved, 6-7 x 2.5-3 μm . White rot on 9 in AT, NY, QB.

Key to Species of *Tylospora*

1. Basidiospores even

Tylospora asterophorum (Bon.) Donk. Basidiocarps white; basidiospores 4-5 μm broad. On 9 in QB.

1. Basidiospores nodulose

Tylospora fibrillosum (Burt) Donk. Basidiocarps white; basidiospores 4-7 μm broad. On 9 in QB.

Subfamily BOTRYOBASIDIOIDEAE

Key to Species of *Botryobasidium*

1. Cystidia absent 2
1. Cystidia present

Botryobasidium ansosum (Jacks. et Rogers) Parm. Basidiocarps cream colored to bright yellow; hyphae with clamps; cystidia abundant, thin-walled, cylindric; basidiospores elliptical to broadly fusiform, 7.5-9 x 3.5-4 μm . White rot on 2 in AZ; 7 in BC, WA.

2. Hyphae simple-septate 3
 2. Hyphae with clamps

Botryobasidium subcoronatum (Hoehn. et Litsch.) Donk. Basidiocarps white to cream colored on drying; basidiospores navicular, tapering to the apex, mostly 7-9 x 3-3.5 μm , but up to 12-15 x 5 μm . White rot on 2 in MT; 3 in BC; 6 in NY; 9 in QB.

3. Basidiospores ellipsoid or navicular, longer than 6 μm 4
 3. Basidiospores ovoid to subglobose, 4-6 x 3-4 μm

Botryobasidium pruinatum (Bres.) J. Erikss. Basidiocarps very thin, grayish white, hypochnoid to arachnoid. White rot on 3 in MN; 7 in AK; 9 in QB.

4. Basidiospores navicular, wider than 3 μm . . . 5
 4. Basidiospores ellipsoid, 8-9 x 2.5-3 μm

Botryobasidium vagum (Berk. et Curt.) Rogers. Basidiocarps cream colored to pale buff. White rot on 2 in AZ, MT; 7 in AK; 9 in QB.

5. Basidia 2-4 sterigmate; basidiospores 8-14 x 6-8 μm .

Botryobasidium flavesceus (Bon.) Rogers. Hymenial surface often becoming tufted in older specimens, whitish or cream to yellowish or olive buff. On 3 in BC.

5. Basidia usually 6-sterigmate; basidiospores 9-12 x 4.5-6 μm

Botryobasidium botryosum (Bres.) J. Erikss. Basidiocarps whitish, yellowish grey, or pale buff, drying yellowish; basidiospores appearing biapiculate. On 7 in AK.

Subfamily GLOEOCYSTIDIELLOIDEAE

Key to Species of *Gloeocystidiellum*

1. Basidiospores smooth. 2
 1. Basidiospores echinulate to asperulate. 5

2. Hyphae with clamps; if dimitic, generative hyphae with clamps 3
2. Hyphae simple-septate

Gloeocystidiellum citrinum (Pers.) Donk. Basidiocarps usually with a whitish fibrillose margin; hymenial surface cream to pale brownish; gloeocystidia mostly imbedded, appearing hyaline and empty, irregular with inflated portions; basidiospores globose, 4-6 μm diam. White rot on 2 in AZ, CO.

3. Basidiospores ellipsoid to oval-ellipsoid, less than 11 μm long 4
3. Basidiospores allantoid, 11-15 x 4.5-6.5 μm

Gloeocystidiellum leucoxanthum (Bres.) Boidin. Hymenial surface bluish white to pale brownish; gloeocystidia cylindrical to narrowly clavate or moniliform; narrow, branched paraphyses present. White rot on 2 in CO.

4. Basidiospores ellipsoid, 4-6 x 2.5-3 μm

Gloeocystidiellum ochraceum (Fr.) Donk. Hymenial surface tuberculate when fresh, becoming smooth on drying, cream to dark ochraceous. On 7 in AK.

4. Basidiospores oval-ellipsoid, 7-9 x 4.5-5 μm

Gloeocystidiellum luridum (Bres.) Boidin. Hymenial surface smooth, bluish grey when fresh, becoming paler and somewhat dirty yellow on drying; gloeocystidia narrowly fusoid. White rot on 2 in AZ.

5. Basidiospores ovate to ellipsoid. 6
5. Basidiospores subglobose to globose, 5-6 μm diam

Gloeocystidiellum furfuraceum (Bres.) Donk. Hymenial surface finely granulose-arachnoid to more continuous and waxy, creamish; gloeocystidia subcylindrical. On 9 in QB.

6. Hyphal system dimitic

Gloeocystidiellum nannfeldtii J. Erikss. Hymenial layer whitish to pale ochraceous or argillaceous;

gloeocystidia sinuous with one or more constrictions; basidiospores $4.5-5.5 \times 2.5-3.5 \mu\text{m}$. On 3 in AK.

6. Hyphal system monomitic

Gloeocystidiellum porosum (Berk. et Curt.) Donk. Hymenial surface whitish cream to yellow; gloeocystidia fusoid, numerous; basidiospores $3.5-5 \times 2.5-3 \mu\text{m}$. White rot on 2 in MT; 5 in CO; 6 in NY.

Subfamily HYPHODERMOIDEAE

Key to Genera

1. Basidiospores mostly less than $3 \mu\text{m}$ wide and $8 \mu\text{m}$ long 2
1. Basidiospores mostly more than $3 \mu\text{m}$ wide and $8 \mu\text{m}$ long 3
 2. Basidiocarps very soft and byssoid, usually rhizomorphic *Amphinema* Karst.
 2. Basidiocarps soft and fibrous but not byssoid, not rhizomorphic. . . *Hyphodontia* J. Erikss.
3. Basidiospores globose to ellipsoid, thick- or thin-walled, smooth or slightly rough 4
3. Basidiospores cylindric to ellipsoid, tending to be flattened on one side or slightly curved, smooth 5
 4. Basidiospores globose to ellipsoid, thin-walled, smooth. . *Radulomyces* Christ. emend. Parm.

Radulomyces notabilis (Jacks.) Parm. Basidiocarps whitish to ivory yellow; hyphae with clamps; hyphal-like paraphyses present; basidiospores $7-9 \times 4.5-7 \mu\text{m}$. On 4 in OT; 9 in MB.

4. Basidiospores subglobose to broadly ellipsoid, rather thick-walled, smooth or slightly rough *Hypochnicium* J. Erikss.

Hypochnicium bombycinum (Fr.) J. Erikss. Basidiocarps cream colored with a wide fibrillose margin, often cracking on drying; hyphae with clamps; basidiospores $7-10 \times 5-6 \mu$. White rot on 2 in ID.

5. Basidiospores pinkish in mass *Peniophora* Cke. emend. Donk
5. Basidiospores not pinkish in mass 6
6. Cystidia thin-walled or with walls slightly thickened at the base 7
6. Cystidia very thick-walled with wall thinning toward the apex *Chaetoderma* Parm.

Chaetoderma luna (Rom.) Parm. Basidiocarps white to cream colored; hyphae with clamps; cystidia abundant, narrowly clavate; basidia clavate, long, and slender; basidiospores cylindric and slightly curved, 12-18 x 4-4.5 μ m. Brown rot on 2 in CO, MT, UT; 3 in AK, BC, YT; 4 in AK; 7 in BC; 9 in AT.

7. Basidiospores narrowly to broadly ellipsoid 8
7. Basidiospores narrowly cylindric, 10-17 x 2-3 μ m *Subulicystidium* Parm.

Subulicystidium longisporum (Pat.) Parm. Cystidia abundant, incrustated with plate-like crystals; basidiocarps white, thin and delicate. White rot on 4 in BC.

8. Basidiocarps white to cream colored or pale buff. *Hyphoderma* Wallr. emend. Donk
8. Basidiocarps golden-ochraceous or mustard colored *Crustoderma* Parm.

Crustoderma dryinum (Berk. et Curt.) Parm. Hyphae with clamps; cystidia usually abundant, cylindric; basidiospores cylindric to oblong-ellipsoid, 8-10 x 3-4 μ m. White rot on 2 in AZ; 3 in AK; 7 in BC; 9 in QB.

Key to Species of *Amphinema*

1. Basidiocarps yellowish with long yellow rhizomorphs

Amphinema byssoides (Fr.) J. Erikss. Hyphae with clamps, cystidia abundant, narrowly cylindric, with clamps, often with fine incrustation; basidiospores short-cylindric to ellipsoid, 5-6 x 2-3 μ m. White rot on 2 in AT, AZ, CO, BC; 3 in AK, BC, YT; 5 in CO; 9 in QB.

1. Basidiocarps snow white, lacking long rhizomorphs

Amphinema tomentella (Bres.) M. P. Chris. Hyphae with clamps; cystidia broadly cylindric, with clamps, mostly smooth; basidiospores obovate, 2.5-4 x 3-3.5 μm . White rot on 2 in AZ.

Key to Species of *Hyphoderma*

1. Gloeocystidia present 2
1. Gloeocystidia absent. 3
2. Cystidia terminally swollen, incrustated or not

Hyphoderma praetermissum (Karst.) J. Erikss. et Strid. Hymenial surface smooth, cracking on drying; hyphae mostly with clamps; embedded gloeocystidia abundant; stephanocysts abundant in some specimens; basidiospores short cylindric to ellipsoid, 8-12 x 4-5 μm . White rot on 2 in AZ, CO, MT; 5 in CO; 9 in QB.

2. Cystidia basally swollen, incrustated

Hyphoderma puberum (Fr.) Wallr. Basidiocarps waxy to horny when dry; hyphae with clamps; gloeocystidia embedded, usually with a swollen base; stephanocysts present in lower subiculum of some specimens; basidiospores cylindric-ellipsoid, 8-12 x 3-4 μm . White rot on 9 in QB.

3. Cystidia present. 4
3. Cystidia absent

Hyphoderma sibiricum (Parm.) Erikss. et Strid. Basidiocarps thin, membranaceous; hyphae with clamps; basidia suburniform with long sterigmata; basidiospores 7-9 x 3-3.5 μm . White rot on 9 in CO.

4. Cystidia septate 5
4. Cystidia not septate. 6
5. Hymenial surface finely warted or hydroid; basidiospores oblong-ellipsoid to short-cylindric, 7-11 x 4-6 μm

Hyphoderma setigerum (Fr.) Donk. Basidiocarps usually thin, abundantly cracked; hyphae with clamps,

some simple septa also present; basidiospores oblong-ellipsoid to short cylindric, 7-11 x 4-6 μm . White rot on 3 in BC.

5. Hymenial surface densely tomentose, pure white; basidiospores oval, 6-8.5 x 3.5-5 μm

Hyphoderma polonense (Bres.) Donk. Basidiocarps floccose; hyphae with clamps; basidia cylindrical. White rot on 9 in QB.

6. Hymenial surface cream to buff or pinkish . . . 7
6. Hymenial surface greenish yellow to golden yellow

Hyphoderma ludovicianum (Burt) comb. nov. (basionym-*Peniophora ludoviciana* Burt, Mo. Bot. Gard. Ann. 12: 244. 1926). Hymenial surface becoming brown to brownish buff on drying; hyphae with clamps, cystidia cylindrical, incrustated or not; basidia subcylindrical; basidiospores oblong to oblong-ellipsoid, 4-6 x 2-3 μm . White rot on 2 in CO, MT.

7. Basidiospores shorter than 12 μm 8
7. Basidiospores 10-16 μm long

Hyphoderma medioburiense (Burt) Donk. Basidiocarps floccose; hyphae with clamps; cystidia cylindrical, sometimes sparsely incrustated; basidiospores cylindrical, slightly curved, 10-16 x 4.5-6 μm . White rot on 2 in CO, MT.

8. Cystidia thin-walled. 9
8. Cystidia thick-walled, projecting to 100 μm

Hyphoderma resinosum (Jacks. et Deard.) comb. nov. (basionym-*Peniophora resinosa* Jacks. et Deard., Can. J. Res. 27, Sec. C, p. 147. 1949.) Basidiocarps with a considerable amount of resinous material; hyphae with clamps; cystidia abundant, clavate, incrustated above with resinous material; basidiospores broadly ellipsoid, 7-9 x 4.5-5.5 μm . On 7 in BC.

9. Hyphal segments not swollen and short; clamps at all septa 10
9. Hyphae composed of swollen, short segments; both simple septa and clamps present

Hyphoderma terricola (Burt) comb. nov. (basionym-
Peniophora terricola Burt, Mo. Bot. Gard. Ann. 12:
 337. 1926). Basidiocarps cream, membranous,
 rigid when dry; cystidia few, subulate, not in-
 crusted; basidiospores broadly ellipsoid to turbinate,
 6-8 x 4-5 μ m. On 3 in AT.

10. Cystidia clavate to moniliform, without a
 swollen base. 11

10. Cystidia fusiform or conical, swollen at
 the base

Hyphoderma argillaceum (Bres.) Donk. Hymenial sur-
 face cream colored to pinkish buff; basidiospores
 ellipsoid, 7-9 x 4-5 μ m. White rot on 2 in CO.

11. Cystidia clavate

Hyphoderma clavigerum (Bres.) Donk. Basidiocarps
 white to cream, at first floccose, becoming pelli-
 culose; basidiospores cylindrical to broadly el-
 liploid, 6-9 x 4-5 μ m. White rot on 9 in QB.

11. Cystidia moniliform

Hyphoderma radula (Fr.) Donk. Hymenial surface
 white to ochraceous, becoming raduloid; basidio-
 spores 9-11 x 3-3.5 μ m. White rot on 4 in OT.

Key to Species of *Hyphodontia*

1. Hymenial surface hydnnaceous to grandinioid; teeth
 with fimbriate apices 2
1. Hymenial surface smooth or slightly warty 9
 2. Basidiospores cylindric 3
 2. Basidiospores subglobose to ellipsoid 6
3. Cystidia large, well differentiated; basidio-
 spores narrowly allantoid 4
3. Cystidia hyphoid to narrowly fusoid; basidio-
 spores short cylindric, straight or slightly
 curved 5
4. Cystidia thin-walled, mostly embedded

Hyphodontia alutacea (Fr.) J. Erikss. Hymenial sur-
 face cream colored to Light Buff; hyphae with clamps;
 cystidia occasionally with clamps; basidiospores 4.5-

9 x 1.5-2 μm . White rot on 2 in AZ; 3 in AK, MN; 7 in WA; 8 in CH; 9 in AT, OT.

4. Cystidia thick-walled, wall thinning at apex

Hyphodontia floccosa (Bourd. et Galz.) J. Erikss. Hymenial surface Light Ochraceous Buff, cracking on drying; hyphae with clamps; basidia in candelabrams; basidiospores 5.5-7 x 1.5-2 μm . White rot on 3 in AK; 9 in AT, QB.

5. Cystidia hyphoid at apices of teeth; basidiospores straight

Hyphodontia papillosa (Fr.) J. Erikss. Hymenial surface densely granular, whitish cream, hyphae with clamps; basidiospores short cylindric to oblong, 2-3 x 4.5-5.5 μm . White rot on 2 in MT.

5. Cystidia narrowly fusoid, scattered throughout hymenium; basidiospores slightly curved

Hyphodontia crustosa (Pers. ex Fr.) J. Erikss. Hymenial surface whitish, yellowish to ochraceous, cracking on drying; hyphae with clamps; basidiospores oblong to subcylindrical, 5.5-7 x 2-3.5 μm . White rot on 2 in CO; 4 in BC.

6. Cystidia thick-walled, wall thinning at apex. 7

6. Cystidia thin-walled. 8

7. Basidiospores cylindric-ellipsoid, 5-7 x 3-4 μm

Hyphodontia abieticola (Bourd. et Galz.) J. Erikss. Hymenial surface light ochraceous to light brownish; hyphae with clamps; cystidia long, clavate. White rot on 4 in NF.

7. Basidiospores broadly ellipsoid, 4.5-5 x 3-3.5 μm

Hyphodontia barba-jovis (Sw. ex Fr.) J. Erikss. Hymenial surface whitish; hyphae with clamps; cystidia cylindrical. On 9 in QB.

8. Basidiocarps compact, waxy

Hyphodontia aspera (Fr.) J. Erikss. Hymenial surface whitish yellow; hyphae with clamps; cystidia fusoid

or cylindrical and capitate; basidiospores obovate, 5-6.5 x 3.5-5 μm . White rot on 2 in AZ, BC, MT; 3 in BC, MN; 7 in BC; 8 in CH; 9 in QB.

8. Basidiocarps loose, floccose

Hyphodontia breviseta (Karst.) J. Erikss. Hymenial surface Light Buff to cream colored; hyphae with clamps; cystidia hyphoid, with slight constrictions or swellings, sometimes slightly incrustated; basidiospores ovoid to ellipsoid, 3-4.5 x 2.5-3 μm . White rot on 2 in MT; 4 in MN, NF; 9 in AT, BC.

9. Basidiospores subglobose to ellipsoid 10
9. Basidiospores allantoid

Hyphodontia subalutacea (Karst.) J. Erikss. Hymenial surface Light Buff; hyphae with clamps; cystidia thick-walled at the base with wall thinning out at apex; basidiospores 6-8 x 1.5-2 μm . White rot on 2 in UT.

10. Cystidia of two types 11
10. Cystidia of one type 12

11. Some cystidia capitate, others sagittate, incrustated at apex

Hyphodontia alutaria (Burt) J. Erikss. Hymenial surface pale buff; hyphae with clamps; capitate cystidia with clamps; basidiospores ellipsoid to subglobose, 4-5 x 3-4 μm . White rot on 3 in MN.

11. Some cystidia capitate, others fusiform

Hyphodontia sambuci (Pers.) J. Erikss. Hymenial surface white; hyphae with clamps; basidiospores ellipsoid to ovate, 5-7 x 4-5 μm . White rot on 5 in CO; 9 in QB.

12. Cystidia septate, with clamps

Hyphodontia pallidula (Bres.) J. Erikss. Hymenial surface cream colored to Light Buff; hyphae with clamps; basidiospores ellipsoid, 3.5-5 x 2.5-3.5 μm . White rot on 2 in AZ, CO; 3 in BC; 9 in QB.

12. Cystidia not septate

Hyphodontia alienata (Lund.) J. Erikss. Hymenial surface pale cream, farinaceous; hyphae with clamps; cystidia abundant, cylindrical, not incrustated; basidiospores broadly ellipsoid, 6-7.5 x 4-4.5 μm . On 9 in QB.

Key to Species of *Peniophora*

1. Gloeocystidia present 2
1. Gloeocystidia not present 3
2. Gloeocystidia elongate, length to width ratio 7 to 1 or greater

Peniophora septentrionalis M. Laur. Basidiocarps pinkish or reddish when fresh, becoming pinkish grey or violaceous or brownish grey on drying; hyphae with clamps; basidiospores cylindrical, slightly curved, 7-10 x 2.5-3.5 μm . On 2 in AT; 3 in AT, BC, SK; 4 in OT, QB; 6 in NS; 9 in AT.

2. Gloeocystidia broad, length to width ratio less than 7 to 1

Peniophora pseudo-pini Weresub. et Gibson. Basidiocarps pinkish brown to brownish purple; hyphae with clamps; basidiospores cylindrical, 6-7.5 x 2-2.5 μm . On 3 in AT, BC, MB; 4 in AT, MB.

3. Basidiospores longer than 7 μm 4
3. Basidiospores 5.5-7 x 2-2.5 μm

Peniophora pithya (Pers.) J. Erikss. Basidiocarps purplish brown, waxy; hyphae with clamps; cystidia conical to subfusiform, heavily incrustated; basidiospores cylindrical, slightly curved. On 2 in AZ, UT; 3 in OT; 4 in NB; 9 in NS, QB.

4. Hyphae simple-septate

Peniophora separans Burt. Basidiocarps pale ochraceous buff or gray, usually with a purple or pinkish tinge; cystidia incrustated at the apex; basidiospores cylindrical, slightly curved, 7-10 x 2-3 μm . On 2 in AT; 3 in AT, BC; 9 in NF.

4. Hyphae with clamps

Peniophora cinerea (Fr.) Cke. Basidiocarps pale gray with a tint of pink, waxy; cystidia conical, thick-walled, heavily incrustated; basidiospores cylindrical, curved, $7.5-9 \times 2.5-3 \mu\text{m}$. On 2 in CO; 9 in AT, CO.

Subfamily PHLEBIOIDEAE

Key to Genera

1. Subhymenial tissue gelatinized and compact, basidia clavate, $4-5 \mu\text{m}$ wide. 2
1. Subhymenial tissue gelatinized or not; basidia cylindric, narrow, up to $3 \mu\text{m}$ wide. *Dacryobolus* Fr.
2. Cystidioles with an apical bulb or halo. *Resinicium* Parm.
2. Cystidioles or cystidia, if present, lacking an apical bulb or halo
. *Phlebia* Fr. emend. Donk

Key to Species of *Dacryobolus*

1. Hymenial surface smooth; cystidia thick-walled

Dacryobolus karstenii (Bres.) Oberw. ex Parm. Hymenial surface cream colored to pale buff, cracking upon drying; hyphae thin-walled and with clamps to thick-walled and aseptate, basidiospores allantoid, $4.5-6 \times 1-1.5 \mu\text{m}$. Brown rot with strong anise odor on 2 in ID, MT; 3 in AK; 7 in AK.

1. Hymenial surface papillate with amber colored droplets at the apices of the papillae; cystidia thin-walled

Dacryobolus sudans (Fr.) Fr. Hymenial surface Pale Ochraceous Buff to Cinnamon; hyphae with clamps, gelatinizing; cystidia clustered at the apices of papillae; basidiospores narrowly allantoid, $4-5.5 \times 0.7-1 \mu\text{m}$. Brown rot on 3 in BC.

Key to Species of *Phlebia*

1. Hymenial surface smooth to tuberculate. 2
1. Hymenial surface hydnaceous

Phlebia hydnoidea (Cke. et Massee) M. P. Chris.
Basidiocarps bluish grey to reddish grey when fresh, whitish when dry; hyphae indistinct; cystidia numerous, thick-walled, incrusting; basidiospores oblong to short-cylindric, $3-4 \times 1.5-2 \mu\text{m}$. White rot on 9 in AT.

2. Cystidia present. 3
2. Cystidia absent 4
3. Cystidia heavily incrusting, conical, imbedded or projecting

Phlebia gigantea (Fr.) Donk. Hymenial surface watery white to cream colored or light buff when fresh; drying horny; hyphae simple-septate; basidiospores cylindric, $5-7 \times 3-3.5 \mu\text{m}$. White rot on 2 in ID, MT, OR; 3 in BC; 9 in QB.

3. Cystidia thin-walled, acicular or fusiform, projecting

Phlebia subserialis (Bourd. et Galz.) Donk. Basidiocarps yellowish to pale buff, waxy; hyphae with clamps; cystidia small, not incrusting; basidiospores ellipsoid to short-cylindric, $5-7 \times 2-2.5 \mu\text{m}$. White rot on 2 in CO; 5 in CO; 9 in QB.

4. Basidiospores $4-5 \times 1.5-2 \mu\text{m}$; calcareous granules projecting from hymenial surface

Phlebia livida (Fr.) Bres. Hymenial surface usually dark reddish brown or purplish on drying; hyphae with clamps, indistinct in subhymenium; basidiospores cylindric. White rot on 2 in AZ, 9 in AT.

4. Basidiospores $5-8 \times 2.5-3.5 \mu\text{m}$; calcareous granules absent from hymenial surface

Phlebia albida Post. ex Fr. Basidiocarps waxy when fresh, drying cartilaginous; hymenial surface usually drying dark reddish brown to purplish; hyphae with clamps; basidiospores cylindric-ellipsoid.

White rot on 2 in AZ, MT.

Key to Species of *Resinicium*

1. Hymenial surface hydnaceous 2
1. Hymenial surface smooth

Resinicium furfuraceum (Bres.) Parm. Basidiocarps thin, waxy to membranous, often cracking on drying; hymenial surface cream colored to light buff; hyphae with clamps; basidiospores oblong-ellipsoid, 4-6 x 2-3 μ m. White rot on 2 in MT; 9 in QB.

2. Hymenial surface slightly hydnaceous; spherical clusters of crystals abundant

Resinicium bicolor (Fr.) Parm. Basidiocarps thin, waxy; hymenial surface cream to watery white; hyphae with clamps; cystidia of two types, some with apical bulb that often ruptures leaving a collarette, others capped by a spherical or stellate mass of crystals; basidiospores short-cylindric, 4-5 x 2.5-3 μ m. White rot on 3 in BC, SK; 4 in NB, OT.

2. Hymenial surface strongly hydnaceous; no spherical clusters of crystals

Resinicium chiricahuaensis Gilbn. et Budington. Basidiocarps cream to bright yellow, teeth numerous, conical, often branched apically; hyphae with clamps; basidiospores allantoid, 4-7 x 1.5-2 μ m. White rot on 2 in AZ; 9 in AT.

Subfamily SISTOTREMOIDEAE

Key to Genera

1. Basidia globose to subglobose or pyriform 2
1. Basidia urniform to clavate 3
 2. Basidia globose to subglobose, 4-sterigmate. *Sphaerobasidium* Oberw.
 2. Basidia pyriform, 4-8 sterigmate.
 - *Paullicorticium* J. Erikss.

3. Basidia developing by repetition from base of collapsed basidia; remains of old basidia persistent at base *Repetobasidium* J. Erikss.
3. Basidia not developing as above 4
4. Basidia 6-8 sterigmate 5
4. Basidia 4-sterigmate.
 *Trechispora* Karst. emend. Liberta
5. Basidia urniform. *Sistotrema* Fr. emend. Donk
5. Basidia tubular
 *Sistotremastrum* J. Erikss. emend. Oberw.

Sistotremastrum suecicum Litsch. ex J. Erikss.
 Basidiocarps at first grayish, then pure white;
 hyphae with clamps; basidiospores oblong, 5-7 x
 2.5-3.5 μ m. On 9 in QB.

Key to Species of *Paullicorticium*

1. Subicular hyphae with clamps

Paullicorticium delicatissimum (Jacks.) Liberta.
 Basidiocarps white to yellowish white; basidia with
 5-7 slender, divergent sterigmata; basidiospores ob-
 long-ellipsoid, hyaline 2.5-3 x 1.5-2 μ m. On 9 in
 QB.

1. Subicular hyphae simple-septate

Paullicorticium pearsonii (Bourd.) J. Erikss.
 Basidiocarps grayish; basidia 5-8 sterigmate;
 basidiospores curved, tapering at both ends, 4-6
 x 2-2.5 μ m. White rot on 9 in QB.

Key to Species of *Repetobasidium*

1. Basidiospores allantoid

Repetobasidium vile (Bourd. et Galz.) J. Erikss.
 Basidiocarps white, inconspicuous; hyphae with
 clamps, cystidia abundant, conical; basidia de-
 veloping directly on substratum; basidiospores
 6-7.5 x 1.5-2.5 μ m. On 9 in QB.

1. Basidiospores subglobose

Repetobasidium mirificum J. Erikss. Basidiocarps whitish; hyphae with clamps; cystidia with a swollen apex; basidiospores $5.5-6.5 \times 5-5.5 \mu\text{m}$.
On 9 in QB.

Key to Species of *Sistotrema*

1. Gloeocystidia absent. 2
1. Gloeocystidia present

Sistotrema coroniferum (Hoehn. et Litsch.) Donk. Basidiocarps whitish; hyphae with clamps; gloeocystidia cylindrical to fusoid, irregular, with yellowish contents; basidiospores oblong-ellipsoid to subcylindrical, $4-5 \times 2-3 \mu\text{m}$. On 2 in CO.

2. Hymenophore strongly hydnaceous to granulose 3
2. Hymenophore smooth

Sistotrema diademiferum (Bourd. et Galz.) Donk. Basidiocarps whitish to grayish yellow, pruinose when dry; hyphae with clamps; basidiospores pyriform to subglobose, $3.5-5 \times 2.5-3.5 \mu\text{m}$. On 9 in QB.

3. Basidiospores short-cylindric to allantoid, $4-7 \times 2-3 \mu\text{m}$

Sistotrema brinkmannii (Bres.) J. Erikss. Basidiocarps white to grayish or buff, pelliculose, cracking into flakes on drying; basidiospores usually flattened on one side. Brown rot on 6 in NB; 9 in NS, QB.

3. Basidiospores cylindric, slightly fusiform, $7-9 \times 2.5-3.5 \mu\text{m}$

Sistotrema raduloides (Karst.) Donk. Basidiocarps pinkish buff, often with well developed teeth, associated with sclerotia. White rot on 3 in AK; 6 in NB.

Key to Species of *Sphaerobasidium* Oberw.

1. Basidiospores elliptical; cystidia present

Sphaerobasidium minutum (J. Erikss.) Oberw. Basidiocarps grayish, inconspicuous; hyphae with clamps; cystidia with an apical bulb, often incrusted; basidiospores 4-5 x 2-3 μm . On 2 in AZ, MT; 9 in QB.

1. Basidiospores navicular to subnavicular; cystidia absent

Sphaerobasidium subinvisible Liberta. Basidiocarps a whitish film, inconspicuous; hyphae with clamps; basidiospores 5.5-6.5 x 2.5-3 μm . On 9 in QB.

Key to Species of *Trechispora*

1. Basidiospores smooth. 2
1. Basidiospores echinulate, verrucose, or stellulate. 3
2. Basidiospores ellipsoid to ovoid

Trechispora submicrospora (Litsch.) Liberta. Basidiocarps white, strongly cracking on drying; hyphae with clamps; basidiospores 3 x 1.5 μm . On 4 in AK; 9 in QB.

2. Basidiospores obovate to subglobose

Trechispora confinis (Bourd. et Galz.) Liberta. Basidiocarps very thin, white to cream colored; hyphae with clamps; basidiospores with a conspicuous apiculus, 3-4 x 2.5-3.5 μm . White rot on 2 in CO; 4 in MN; 9 in QB.

3. Basidiospores echinulate or verrucose 4
3. Basidiospores stellulate

Trechispora stellulata (Bourd. et Galz.) Liberta. Basidiocarps cream colored; hyphae with clamps; basidiospores 5-6 rayed, 2.5-4 μm broad. On 9 in QB.

4. Hymenial surface not poroid 5
4. Hymenial surface poroid

Trechispora candidissima (Schw.) Bond. et Sing.

Basidiocarps white, soft and fragile, rhizomorphic; pores angular, 2-4 per mm; hyphae with clamps; basidiospores echinulate, ovoid to subglobose 3.5-4.5 x 3-3.5 μm . On 9 in QB.

5. Hymenial surface grandinioid or smooth. 6
5. Hymenial surface over intertwined, ropy strands

Trechispora vaga (Fr.) Liberta. Rope-like strands pale yellowish brown to dark purplish brown; margin cream to bright yellow; some hyphae thin-walled, with clamps, others thick-walled and aseptate; basidiospores echinulate, obovate to ellipsoid, 4.5-6 x 2.5-3.5 μm . White rot on 2 in CO; 3 in NF; 5 in CO.

6. Hymenial surface pale orange, hyphal system dimitic; basidiospores subglobose

Trechispora pallidoaurantiaca Gilbn. et Budington. Hymenial layer pelliculose on a pale orange brown subiculum; generative hyphae with clamps; cystidia hyphoid; basidiospores echinulate, 3-4 μm diam. On 4 in AT.

6. Hymenial surface whitish or pale buff; hyphal system monomitic; basidiospores ellipsoid

Trechispora farinacea (Pers. ex Fr.) Liberta. Basidiocarps whitish or pale buff; hymenial surface smooth, grandinioid or hydneous; margin occasionally rhizomorphic; hyphae with clamps; basidiospores ellipsoid to subglobose, finely echinulate, 3.5-4.5 x 3-3.5 μm . White rot on 5 in CO; 9 in AT, QB.

Subfamily TUBULICRINIOIDEAE

Key to Genera

1. Basidia clavate; cystidia thick-walled, with expanded lumen at apex in most species.
 *Tubulicrinis* Donk
1. Basidia usually short cylindric; cystidia if present not as above. *Xenasma* Donk

Key to Species of *Tubulicrinis*

1. Cystidia with lumen capillary 2
1. Cystidia with lumen noncapillary, with an umbrella-like structure at apex

Tubulicrinis hamatus (Jacks.) Donk. Basidiocarps white; hyphae with clamps; basidiospores ellipsoid, 5.5-7.5 x 4-4.5 μ m. White rot on 9 in QB.

2. Cystidia mostly thick-walled with lumen expanding at apex to form a thin-walled apical bulb. 3
2. Cystidia mostly thick-walled with a narrow lumen extending to apex

Tubulicrinis chaetophorus (Hoehn.) Donk. Basidiocarps white to cream, cracking into small blocks; subicular hyphae mostly with clamps, some thick-walled, aseptate; cystidia weakly amyloid in Melzer's reagent; basidiospores narrowly ellipsoid, 4.5-6 x 2.5-3 μ m. White rot on 9 in QB.

3. Apices of cystidia rounded 4
3. Apices of cystidia acute

Tubulicrinis subulata (Bourd. et Galz.) Donk. Hymenial surface whitish to cream; subicular hyphae infrequently with clamps; cystidia weakly amyloid in Melzer's reagent; basidiospores cylindrical to allantoid, 6-10 x 1.5-2 μ m. White rot on 5 in CO; 9 in QB.

4. Apical bulb usually not exceeding the largest diameter of the cystidium 5
4. Apical bulb broader than the largest diameter of the cystidium

Tubulicrinis accedens (Bourd. et Galz.) Donk. Basidiocarps grayish; hyphae with clamps; basidiospores cylindric-ellipsoid to ellipsoid, 3-4.5 x 2-3 μ m. White rot on 9 in QB.

5. Lumen of cystidia expanding abruptly 6
5. Lumen of cystidia expanding gradually

Tubulicrinis angustus (Rogers et Weresub) Donk.

Basidiocarps grayish; hyphae with clamps; basidiospores cylindrical, sometimes slightly curved, 7-11 x 1.5-2 μ m. On 9 in QB.

6. Lumen of cystidia expanding symmetrically . . . 7
 6. Lumen of cystidia expanding asymmetrically

Tubulicrinis calothrix (Pat.) Donk. Basidiocarps white to Light Buff; hyphae with clamps; cystidia capped by a cluster of crystalline material, weakly amyloid in Melzer's reagent; basidiospores cylindrical to oblong-ellipsoid, 5.5-7.5 x 2-3 μ m. White rot on 9 in QB.

7. Lumen of cystidia expanding abruptly to form a cylindrical apical bulb

Tubulicrinis glebulosus (Bres.) Donk. Basidiocarps cream to yellowish tan; hyphae with clamps; basidiospores cylindrical to slightly allantoid, 6-9 x 1.5-2 μ m. White rot on 9 in MT, QB.

7. Lumen expanding abruptly to form a short, rounded apical bulb

Tubulicrinis propinqua (Bourd. et Galz.) Donk. Basidiocarps white to cream; hyphae with clamps; cystidia sometimes incrustated around the apex; basidiospores cylindrical, slightly curved, 5-8 x 1.5-2 μ m. On 3 in MB; 9 in QB.

Key to Species of *Xenasma*

1. Basidiospores slightly amyloid. 2
 1. Basidiospores nonamyloid 3
 2. Basidiospores oblong-ellipsoid, laterally depressed to short-allantoid, 4-4.5 x 2.5-3 μ m

Xenasma grisellum (Bourd.) Liberta. Basidiocarps white to pale buff; hyphae with clamps. On 9 in QB.

2. Basidiospores ellipsoid to allantoid, 5-6.5 x 2-3.5 μ m

Xenasma rallum (Jacks.) Liberta. Basidiocarps gray

or bluish gray to light buff; hyphae with clamps.
On 7 in BC.

3. Basidiospores smooth, narrowly clavate, laterally depressed near the apiculus; cystidia absent

Xenasma gaspeticum Liberta. Basidiocarps light gray, inconspicuous; hyphae with clamps; basidiospores 5.5-7 x 1.5-2 μ m. On 9 in QB.

3. Basidiospores roughened, broadly ellipsoid to subglobose; cystidia present

Xenasma rimicolum (Karst.) Donk. Basidiocarps hyaline or bluish gray, sometimes yellowish in older portions; hyphae with clamps; cystidia cylindrical to slightly subulate, walls thickened below, tapering to thin near the apex; basidiospores 8.5-10 x 4.5-7 μ m. On 9 in QB.

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numbers.

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Magasi, L. P. 1966. Index to the fungi of the Maritimes region of Canada. For. Res. Lab. Fredericton, N. B. Inf. Rept. M-X-7. 94 p.

Martinez, Maximino. 1963. Las Pinaceas Mexicanas. Secretaria de Agricultura y Ganaderia, Subsecretaria de Recursos. Forestales y de Caza, Mexico City. 362 p.

Shaw, C. G. 1973. Host fungus index for the Pacific Northwest - 1. Hosts. Wash. Agr. Exp. Sta. Bull. 765. 121 p.

MYCOTAXON

Vol. VI, No. 1, pp. 78-126

July-September 1977

SPECIFIC AND INFRASPECIFIC NAMES FOR FUNGI USED IN 1821.

V. N - Z.¹

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A brief discussion of the results of this study is offered, additional pre-1821 literature cited, and appropriate names traced to their origination.

The reader is referred to the introduction to the first in this series for the problems and goals surrounding the series' inception. Arriving now at the culmination of the series, it is time to sum up and to draw some conclusions.

1. It is quite reasonable, using the protologues of the 1821 authors, to trace the origin of virtually every name validated in 1821. It is concomitantly impossible, given certain combinations of validating authors in 1821, to accurately cite the correct (or first) validating author, for the actual sequence of publications *within* 1821 is only imperfectly known. For example, *Erysiphe aceris*, originated by De Candolle, was validated by St. Amans and Mérat, and should be cited as *Erysiphe aceris* DC per St. Amans, for St. Amans' publication is known to have appeared before that of Mérat. Conversely, the validator for *Agaricus annularius* [Bull.] cannot be cited accurately, for the dates of publication for Nocca & Balbis and Roques are not known, so that either of these could have preceded St. Amans, the earliest *sequenceable* validator. Nomenclatural technicians will wish to grapple with this problem, but it does not appear insurmountable.

2. It has been shown again and again that pre-1821 authors *often* generated new names for previously named taxa, and that these new names (which would clearly have been *nomina superflua* had they been proposed *after* the starting point) were repeatedly validated in or after 1821. Bolton was notorious for this practice (cf Petersen, 1977), but Bulliard and Sowerby shared in the guilt. In fact, of course,

¹Previous numbers in this series are as follows: I. A-B. Mycotaxon 1: 149-188. 1975; II. C. *ibid.* 2: 151-165. 1975; III. D-G. *ibid.* 3: 239-260. 1976; IV. H-M. *ibid.* 4: 185-210. 1976.

this practice contributed heavily to the eventual codification of botanical nomenclature. In order to preserve "common usage" of such names, and to prevent their elimination in favor of prior, but obscure names, a later starting point is still advisable and presumably should be retained as 1 January 1821.

3. The number of pre-1821 literature sources has grown quite large, but my search, performed totally outside such established literature reviews as that by Lindau & Sydow, indicates that many more floristic works including fungus names will be rediscovered, often with one or two new names, the taxonomic concepts of which are either obscure or confusing. For example, an important source for Bulliard was a publication by Johan Pauli, cited as "Nomencl. Fung.," but the publication, its date and its scope are all unknown to me. Suffice to say, nonetheless, that retention of later starting points as a sort of nomenclatural "checkpoint" prevents such obscure names from leaping into prominence upon their resurrection.

4. Farlow & Atkinson (1910) summarized the thinking behind the selection of both later starting points and the starting point books (Fries and Persoon), as follows: "This opinion was based on the principle that *uniformity in the selection of the earliest comprehensive work treating a group, large or small, in a somewhat modern sense*, was of more importance than the principle of uniformity of date" [*italics theirs*]. The capricious attitude toward generating new names before 1800 was stifled largely by Persoon's "Synopsis Methodica Fungorum," which gave the practicing botanist *one* source for names. When Fries wrote the "Systema" and "Enenchus" he rather faithfully adopted names used by Persoon, and thus perpetuated these names, again screening out many names considered synonyms (including many names with priority), and dampening the urge to give new names to previously named taxa. The combination of Persoon and Fries established a high level of stability of nomenclature in the fungi, and mycologists were generally not plagued with the difficulties of nomenclature which eventually led to De Candolle's "Lois." In this way, therefore, mycology still lies in debt to its colleagues at the Brussels Congress, for although the selection of starting point books was made during a short recess, the selection was made wisely. Perhaps selection of only Persoon's book ultimately would have avoided future problems, but those problems were 50 years in surfacing, and still do not appear insurmountable.

5. At least two topics are important but peripheral to the intent of this series. While they should be mentioned, no solutions are offered, and these topics can be the subjects of other papers.

a). Post-1821 validation. Although Fries (Systema I, 1821) intended to give the basidiomycetes comprehensive coverage, and, therefore, validated many names in this group,

other authors validated many names in other groups (i.e. names in *Sphaeria*, *Peziza*, etc.). Whether later volumes of *Systema* and *Elenchus* should possess starting point status or not, is very important and will be discussed elsewhere.

b). Pre-1821 typification. Typification of pre-starting point names validated in or after 1821, has never been argued to conclusion, nor will it be discussed here. This series, however, now makes possible the identification of the originating pre-1821 author, and thereby, clues to the location of real or potential types. Again, this will be the subject of another paper.

MORE PRE-1821 MYCOLOGICAL LITERATURE

Balbis, Giovanni Battista. 1801. Elenco delle piante crescenti ne contorni di Torino. 82 pp [genera of plants arranged alphabetically-fungi throughout]. Torino. [pp. 83-102 entitled "Additamentum ad floram Pedemontanum," with fungi on pp. 101-102].

Balbis, Joanne Baptista. 1804. Miscellanea botanica ubi et rariorum horti botanici stirpium, minusque cognitarum descriptiones, ac additamentum alterum ad floram pedemontanam, et ad elenchum plantarum circa Taurinensem urbem nascentium; tum locorum natalium indicatio, ac observationes botanicae continentur. 68 + 11 pls. [fungi pp. 49-68]. Taurin.

Balbis, J. B. 1806. Miscellanea altera botanica. 43 + 2 pls [Fungi pp. 38-43]. Taurin.

Balbis, Johanne Baptista. 1806. Flora Taurinensis sive enumeratio plantarum circa Taurinensem urbem nascentium. xvi + 224 [fungi pp. 192-224]. Taurin.

Bergeret, Jean Pierre. *Phytonomatotechnie universelle, c'est-a-dire, l'art de donner aux plantes des noms tirés de leurs caractères; nouveau systeme au moyen duquel on pent de soi-meme, sans le secours d'aucun livre, nommer toutes les plantes qui coirissent sur la surface de notre globe. A la publication de ce systeme, on joint les figures, les descriptions les plus méthodique, l'analyse, les propriétés, les virtus, l'usage, l'etymologie & la synonymie de toutes plantes de la France.*

Vol. I. 1783. Paris. 240 + many plates

Vol. II. 1784. Paris. 252 + many plates

Berkenhout, John. 1789. Synopsis of the natural history of Great Britain and Ireland, containing a systematic arrangement and concise description of all the animals, vegetables, and fossils, which have hitherto been discovered in these kingdoms. London. Vol. II. 380 p. [fungi pp 352-363].

Bernardino ab Ucria, P. F. 1789. Hortus regius panhormitanus aerae vulgaris anno MDCCLXXX. Noviter extractus septoque ex indigenis, exoticisque plurimas complectens plantas accurantae. Panormi. vi + 498 [fungi pp 445-447].

Biroli, Joanne. 1808. Flora Aconiensis seu plantarum in Novariensi Provincia sponte nascentium descriptio. Vol. II. 260 pp [fungi pp 208-252]. Novari.

Brisseau-Mirbel, C. F. 1806. Histoire Naturelle, generale et particulaire des plantes; ouvrage faisant suite aux oeuvres de LeClerc de Buffon, et partie du cours complet d'histoire naturelle rédigé par C. S. Sonnini, membre de plusieurs sociétés savantes. Paris. Vol. III. [fungi pp 35-74].

Buniva, M. F. 1790. Nomenclator Linnaeanus. Florae Pedemontanae. Augustae Taurinorum. xxxv + 189 [genera of plants arranged alphabetically, with fungi throughout].

Jacquin, N. J. J. 1778. Fungi quidam subalpini. Misc. Austriaca 1: 135-146.

Jacquin, N. J. J. 1781. Observationes botanicae. Misc. Austriaca 2: 292-379.

Kirby, Wm. 1800- Observations upon certain fungi, which are parasites of the wheat. Trans. Linnaean Soc. [London] 5: 112-125.

LEM: Lamarck, J. B. de. 1783-1808. Encyclopedie Methodique. Botanique. Eight volumes [fungi alphabetically throughout]. Paris & Liège. [Often cited as "Dict."]

Lambert, A. B. 1798. Description of the blight of wheat, *Uredo frumenti*. Trans. Linnaean Soc. [London] 4: 193-194.

LIL: Liljeblad, Samuel. 1816. Utkast till en Svensk Flora eller afhandling om Svenska Växternas väsendteliga kännetecken och nytta. Upsala. Introd. + lvi + 761 + map [fungi pp 643-682].

- Otto, S. G. 1816. Versuch einer auf die Ordnung und den Stand der Lamellen gegründeten Anleitung und Beschreibung der Agaricorum. Leipzig [pagination unknown].
- Pulteney, Richard. 1794. The history and description of a minute epiphyllous *Lycoperdon*, growing on the leaves of the *Anemone nemorosa*. Trans. Linnaean Soc. [London] 2: 305-312.
- REICH: Reichard, Johann Jacob. 1780. Botanische Bemerkungen. Schrift. Berlin. Gesell. naturf. Freunde 1: 310-319.
- Reyger, Gottfried. 1768. Die um Danzig wildwachsende Pflanzen nach ihren Geschlechtstheilen geordnet, Danzig. Forward + 431 [fungi pp 371-383].
- Rubel, Francisco. 1778. Agaricum officinale. Misc. Austriaca 1: 164-203 [this is dated 20.ii.1778, but this may be the date of the defence of thesis].
- Schaeffer, J. C. 1773 ["1. ix"]. Enleichterte Arzneykraeuter-wissenschaft. Regensburg. 234 + index + 6 pls [fungi in tables only].
- SCHR: Schrader, Henrico Adolpho. 1794. Spicilegium Florae Germanicae. introd. + 194 [fungi pp 114-189]. Hannover.
- THOR: Thore, J. 1803. Essai d'une chloris du Département des Landes. Paris. xliv + 516 [fungi pp 471-499].
- Tournon, D.-J. 1811. Flore de Toulouse, ou description des plantes qui croissent aux environs de cette ville, avec l'indication de leur lieu natal, l'époque de leur ploraison, des observations sur leurs propriétés en medecine, en économie rurale, et les tables de leurs noms Francais, Latins et patois. xxii + 393. Toulouse.
- Viborg, Erik. 1793. Forsog til systematiste Danske Ravne af indenlandse Planter forsattet til Brug for Loerlingerne med den Kongelige Veterinaerskole. Introd. + 344 [Fungi pp 254-276]. Kisbenhavn.
- Vitman, Fulgentii. 1770. De medicatis herbarum facultatibus liber ex veteri medicorum fide, ex probata nuperorum observatione, ex pribatoquarundam gentium usu methodo botanica. Pars prima. Faventiae. xvi + 373.

- Wade, Walter. 1804. *Plantae rariores in Hibernia inventae; or habitats of some plants, rather scarce and valuable, found in Ireland; with concise remarks on the properties and uses of many of them.* Dublin. xiv + 214 [fungi pp 168-192].
- Wahlenberg, Georgio. 1820. *Flora Upsaliensis, enumerans plantas circa Upsaliam sponte crescentes. Enchiridion excursionibus studiosorum Upsaliensium accomodatum.* viii + 495 + map [Fungi pp 438-478]. Upsala.
- Withering, William. 1794. A new method of preserving fungi, etc... *Trans. Linnaean Soc.* [London] 2: 263-266.
- Woodville, William. 1794. A supplement to medical botany, or, part the second: containing plates with descriptions of most of the principal medicinal plants not included in the material medica of the collegiate pharmacopoeias of London and Edinburgh: accompanied with circumstantial detail of their medical effects, and of the diseases in which they have been successfully employed. London. 169 + index.
- Woodward, Thomas Jenkinson. 1794. An essay towards an history of the British stellated Lycoperdons: being an account of such species as have been found in the neighborhood of Bungay, in Suffolk. *Trans. Linnaean Soc.* [London] 2: 32-62.
- Woodward, T. J. 1794. Additional note to the essay on the stellated Lycoperdons, referred to *L. recolligens*, at p 58. *Trans. Linnaean Soc.* [London] 2: 323-324.

Acknowledgements

The staff of the library of The New York Botanical Garden has been most kind in allowing me stack privileges, and in helping search out obscure literature. Three proofreaders have assisted: Ms. Jean Allen, Ms. Jenny Freeman, and Ms. Donna Gallaher. My special thanks goes to Ms. Pat Cathcart, who typed the entire series of manuscripts.

-- N --

- nanum (Helmisporium) LD 20: 496, G: 556 ← [NS: 67]
 nanus (Agaricus) Fr: 200 ← [PS: 357]
 nanus (Agaricus harioiorum var.) M: 74, var. nov.
 narcoticus (Agaricus) Fr: 311, as "A. CPR." ← [BEFC 1: 79]
 narcoticus (Agaricus) R: 38 ← [BEFC 1: 79]
 nebularis (Agaricus) Fr: 86, HFD 12: t. 1734 ← [BEFC 2: 25]
 nebularis (Gymnopus) G: 609 ← [BEFC 2: 25 (Agaricus)]
 nebulosa (Sphaeria) Schl: 59, FSS no. 197 ← [POM 2: 69] Fr: 2: 430
 nebulosum (Exormatostoma) G: 522 ← [POM 2: 69 (Sphaeria)]
 necans (Lactarius) G: 625 ← [BH: 489, pl. 529 fig. 2, pl. 14 ("necator")]
 necator (Agaricus) Fr: 64, SA: 565, M: 54, P: 397, R: 28 ← [BH: 489, pl. 14, 529, fig. 2]
 neesii (Polyporus) Fr: 370, sp. nov.
 nefrens (Agaricus) Fr: 209, sp. nov.
 nemoralis (Agaricus) P: 225 ← [With: 239]
 nemoreus (Agaricus) Fr: 99 ← [PS: 305]
 nictitans (Agaricus) Fr: 38, sp. nov.
 nidula (Sphaeria) G: 529 ← [S: p.f.pl. 394]
 nidulans (Agaricus) Fr: 189 ← [PID: 19]
 nidulans (Peziza) Schl: 58, ← ["Schm. & K."]
 nidulans (Polyporus) Fr: 362, nom. nov.
 niger (Agaricus croceus var.) M: 78, var. nov.
 nigra (Clavaria coriacea var.) M: 33, var. nov.
 nigra (Helvella mitra var.) P: 255, nom. nov.
 nigra (Peziza) M: 26, SA: 535, G: 666 ← [BH: 238, pls. 116, 480, fig. 1]
 nigra (Sphaeria) P: 489 ← [S: p.f.pl. 393]
 nigra (Tremella cerebrina var.) M: 28 ← [BH: 221]
 nigra (Virgaria) G: 553 ← [NS: 54]
 nigrescens (Cephalotrichum) G: 563 ← [LM 3: 20 ("rigescens")]
 nigrescens (Tubercularia) SA: 615 ← [BH: 217, pl. 455, fig. 1 (Tremella "nigricans")]
 nigricans (Agaricus) N&B: 329, M: 60 ← [BH: 587, pls. 212, 579, fig. 2 ("nigrescens")]
 of text, "nigricans" of index]
 nigricans (Helvella) LD 20: 512 ← [Sch 4: 102 (Elvella)]
 nigricans (Polyporus) Fr: 375, sp. nov.
 nigricans (Rhizopus) ENA: 198, nom. nov.

- nigricans (Tubercularia) M: 129 ← [BH: 217, pl. 455, fig. 1 (Tremella)]
 nigripes (Agaricus) SA: 571, N&B: 313, M: 62 ← [BH: 476, pls. 344, 519, fig. 2]
 nigripes (Merulius) M: 47 ← [PS: 489]
 nigro-cinctus (Hypochnus) Ehren: 519, Spr: 310 ← [Ehor: 85]
 nigrocinctus ([Hypochnus]) LD 22: 369 ← [Ehor: 85]
 nigrovirescens (Hypoderma) LD 22: 371, nom. nov.
 nigrum (Astroma) G: 524 ← [S: p.f.pl. 393 (Sphaeria)]
 nigrum (Hydnum) Fr: 404 ← [FO 1: 134]
 nigrum (Stilbum) Schl: 59, M: 18 ← ["Persoon"]
 nitens (Agaricus) Fr: 284 ← [Vahl, FD 18: pl. 1067 + acc. text]
 nitens (Agaricus) Fr: 116 ← [BEFC 2: 21]
 nitens (Agaricus) M: 84, SA: 585 ← [BH: 424, pls. 84, 566, fig. 4 ("niteus" of index)]
 nitens (Gymnopus eburneus [var.]) G: 610 ← [S: p.f.pl. 71 ← Sch 4: 60 (Agaricus)]
 nitida (Thelephora hirsuta var.) Schl: 60 ← [PD: 30 (Stereum)]
 nitidum (Sclerotium) Schl: 59 ← ["Persoon?"]
 nitidum (Agaricus) Fr: 55+ (as var.) ← [PS: 444 (A. Russ[ula] —)]
 nitidus (Polyporus) Fr: 379 ← [POM 1: 15 (Poria)]
 nitidus (Agaricus araneosus var.) M: 82, SA: 583 ← [BH: pl. 431, fig. 14 ("niudus")]
 nitratu (Agaricus murinaceus var.) M: 77 ← [PS: 356 (Agaricus)]
 nivea (Peziza) P: 456 ← [Dick 1: 21]
 nivea (Sphaeria) M: 141, Schl: 59, H: 6, P: 283, L: 486 ← [HV 1: 28]
 niveum (Hydnum) Fr: 419, LD 22: 96, M: 37 ← [PS: 563 (Hydnum) PD: 30 (Odontia)]
 niveus (Agaricus) Fr: 311, as "A. COPR." ← [PS: 400]
 niveus (Agaricus) H: 22 ← [With: 235 ← Scop: 430]
 niveus (Agaricus) P: 433 ← [JFA 3: 48, pl. 288]
 niveus (Agaricus coprinus) Z: 107+ ← [PS: 400 (Agaricus copr[inus] —)]
 niveus (Agaricus russula) Z: 353+ ← [PS: 438 (Agaricus russ[ula] —)]
 nostoc (Tremella) P: 509 ← [LSpl: 1625]
 nucisedus (Agaricus) Fr: 293 ← [FO 2: 176]
 nuda (Cortinaria) G: 628 ← [BH: 605, pl. 439 (Agaricus)]
 nuda (Thelephora) Fr: 447, sp. nov.
 nudus (Agaricus) Fr: 52, SA: 582, M: 80, L: 475 ← [BH: 605, pl. 439]
 nudus (Agaricus nudus var.) M: 80 ← [BH: 605 (Agaricus —)]
 nudus totus rufescens (Agaricus nudus var.) M: 80+ ← [BH: 605, pl. 439 (Agaricus —)]
 nummularia (Coltricia) G: 644 ← [BH: 335, pl. 124 (Boletus)]

nummularia (Sphaeria) SA: 522, M: 141, LD 22: 386 ← [BH: 179, pl. 468, fig. 4 (Hypoxylon)]
 nummularius (Boletus) N&B: 336, M: 43, P: 437 ← [BH: 335, pl. 124]
 nutans (Agaricus) Fr: 302, nom. nov.

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obesus (Agaricus) P: 393 ← [BEFC 2: 89]
 obesus (Gymnopus) G: 607 ← [BEFC 2: 89 (Agaricus)]
 oblectus (Coprinus) G: 634 ← [Bolt: 142, pl. 142 (Agaricus)]
 obliquatus (Boletus) L: 471, M: 43, N&B: 337, SA: 552 ← [BH: 335, pls. 7, 459]
 obliquum (Hydnum) Fr: 424 ← [Schr: 179]
 obliquus (Agaricus) Fr: 169 ← ["PIC: pl. 13, fig. 3"]
 obliquus (Boletus) P: 246 ← [PS: 548]
 obliquus (Polyporus) Fr: 378 ← [PS: 548 (Boletus)]
 oblongum (Geoglossum) G: 659, sp. nov.
 obolus, (Agaricus) Fr: 89, sp. nov.
 obrusseus (Agaricus) Fr: 104, nom. nov.
 obscurus (Agaricus) P: 198+, sp. nov.
 obscurus (Didymocrater) MNA: 509, sp. nov.
 obturatus (Agaricus) Fr: 283, sp. nov.
 obtusa (Clavaria) P: 268 ← [S: p.f.pl. 334]
 obtusa (Odontia) G: 651 ← [Schr: 178 (Hydnum)]
 obtusata (Aregma) Schl: 56 ← ["Fr[ies?"]]
 obtusatus (Agaricus) Fr: 293 ← [PS: 428]
 obtusum (Geoglossum) G: 659 ← [S: p.f.pl. 334 (Clavaria)]
 obtusum (Hydnum) Fr: 419, Schl: 57 ← [Schr: 178]
 obtusum (Agaricus) Fr: 233, sp. nov.
 obtusus (Boletus) G: 642, N&B: 339, SA: 550 ← [PS: 538 (B. fomentarius var.)] ← POM 2:
 4)]
 occarium (Hydnum) Fr: 412 ← [BEF: 113]
 ocellatus (Agaricus) Fr: 134 ← [FO 1: 83]
 ochracea (Himantia) LD 21: 164 ← [FO 1: "210"]
 ochracea (Solenia) Schl: 59 ← ["Höf[ann?"]]
 ochracea (Thelephora) Fr: 446 ← [FO 1: 151]

- orcellus (Pleuropus) G: 615 ← [BH: 519, pls. 591, 573, fig. 1 (Agaricus)]
 oreades (Agaricus) Fr: 127 ← [Bolt: 151, pl. 151]
 oreinus (Agaricus) Fr: 52 ← [FØ 2: 98 ("Orcinus")]
 orientale (Hydnum) Fr: 407, nom. nov.
 orobanches (Rhizoctonia) M: 135, sp. nov.
 ostraceum (Hysterium) M: 153, LD 22: 386, SA: 515 ← [BH: 170, pl. 444, fig. 4 (Hypoxylon)]
 ostreatus (Agaricus) Fr: 182, P: 239 ← [CFL 3: pl. 216 + acc. text ← JFA: 2: 3, pl. 104]
 ostreatus (Crepidopus) G: 616 ← [CFL 3: pl. 216 + text ← JFA: 2: 3, pl. 104 (Agaricus)]
 ovata (Pistillaria) Fr: 497, not 298 ← [PCC: 85 (Clavaria)]
 ovata (Stilbospora) M: 147 ← [POM 1: 31]
 ovatus (Agaricus) H: 24, P: 426 ← [CFL 2: pl. 10 + text]
 ovina (Sphaeria) FSS: no. 149, G: 527, M: 144 ← [PS: 71] Fr 2: 446
 ovinus (Agaricus) Fr: 109, M: 71 ← [BH: 592, pl. 580]
 ovinus (Polyporus) Fr: 346 ← [Sch 4: 83, pls. 121, 122 (Boletus)]
 ovoideus (Agaricus) SA: 589 ← [BH: 668, pl. 364]
 ovoideus (Agaricus) Fr: 15, M: 88, L: 476 ← [BH: 668, pl. 364 ("ovooides")]
 oxycanthae (Erysiphe) M: 132 ← [DC 6: 106]
 oxycanthae (Hypoderma xylomoides var.) M: 151, var. nov.
 oxycoccus (Hysterium) FSS: no. 169, sp. nov.
- P --
- pachypus (Boletus) Fr: 390 ← [FØ 1: 118]
 palisoti (Daedalea) Fr: 335, nom. nov.
 pallescens (Calycina) G: 670 ← [POM 2: 85 (Peziza)]
 pallescens (Polyporus) Fr: 369 ← [FØ 2: 256]
 pallida (Helvella) LD 20: 512 ← [Sch 4: 112, pl. 282]
 pallida (Typhoderma) G: 559 ← ["Dill[wyn] Conf., 78" (Conferva)]
 pallida (Peziza chrysocoma var.) M: 21, var. nov.
 pallidum (Erineum fagineum var.) M: 16†, var. nov.
 pallidus (Agaricus) Fr: 67, R: 30 ← [PD: 64 (Lactaria)]
 pallidus (Agaricus) N&B: 316, P: 183 ← [Sch 4: 22: pl. 50]
 pallidus (Agaricus lactifluus) Z: 316† ← [PD: 64 (Lactaria)]

- ochraceo-fuscus (Agaricus) Fr: 168 ← [Mey: 301]
 ochraceum (Hydnum) Fr: 414 ← [Persoon apud GSN: 1440]
 ochraceum (Steccherinum) G: 651 ← [Persoon apud GSN: 1440 (Hydnum)]
 ochraceus (Agaricus) M: 85, SA: 586 ← [BH: 644, pls. 362, 530, fig. 3]
 ochroleuca (Peziza) P: 458 ← [Bolt: 105, pl. 105]
 ochroleuca (Thelephora) Fr: 440 ← [FO 2: 276]
 ochroleucus (Agaricus) Fr: 234 ← [Sch 4: 24]
 ochroleucus (Agaricus pectinatus var.) M: 52 ← [Sch 4: 24 (Agaricus)]
 ochroleucus (Agaricus pectinatus [var.]) SA: 562 ← [Sch 4: 24 (Agaricus)]
 odorata (Thelephora) Fr: 445, not 448 ← [FO 1: 151]
 odoratus (Polyporus) Fr: 373 ← [JColl 2: 150 (Boletus)]
 odorus (Agaricus) Fr: 90†, P: 394, R: 37, M: 70 ← [BH: 567, pls. 176, 556, fig. 3]
 odorus (Gymnopus) G: 606 ← [BH: 567, pls. 176, 556, fig. 3 (Agaricus)]
 oedematopus (Agaricus) Fr: 96 ← [Sch 4: 69, pl. 259]
 officinalis (Polyporus) Fr: 365 ← [Vill[ars?], "Delph: 1041"]
 olearius (Agaricus) Fr: 273, R: 53 ← [DC 6: 44]
 olivacea (Virgaria) G: 553 ← [LM 3: 14 (Botrytis)]
 olivaceo-albus (Agaricus) Fr: 35 ← [FO 1: 5]
 olivaceum (Geoglossum) Fr: 489 ← [POM 1: 40]
 olivaceum (Boletus) P: 439 ← [Sch 4: 77, pl. 105]
 olorius (Agaricus) Fr: 92 ← [FO 2: 143]
 omphalodes (Peziza) M: 21, SA: 531 ← [BH: 264, pl. 485, fig. 1]
 oniscus (Agaricus) Fr: 172 ← [FO 2: 209]
 onobrychis (Xyloma) SA: 518 ← [DC 6: 159 ("onobrychidis")]
 onotica (Scodelinia) G: 668 ← [PS: 637 (Peziza)] Fr 2: 48
 opegraphoides (Hysterium) LD 22: 400 ← [DC 2: 307]
 ophioglossoides (Clavaria) M: 32, SA: 540, P: 472, ← [LSpPl: 1652]
 ophioglossoides (Hypoxylon) G: 512 ← [LSpPl: 1652 (Clavaria)]
 opicus (Agaricus) Fr: 43 ← [FO 2: 112]
 orbiculare (Hysterium) Spr: 310 ← [EHor: 98]
 orbicularis (Erysibe) ENA: 203, nom. nov.
 orbiculatum (Hydnum) Fr: 412 ← [PS: 559] ← "Balbis. Elenchus Rec. Stirp.: 5"]
 oreades (Agaricus) P: 407 ← [WBA: 335 ("oreades")] ← Bolt: 151, pl. 151 ("oreades")]
 oreadis (Agaricus) H: 21, nom. nov.
 orcellus (Agaricus) Fr: 180, M: 52, N&B: 330 ← [BH: 519, pls. 591, 573, fig. 1]

- palmata (Clavaria) Fr: 469 ← [PS: 588]
 palmata (Thelephora) Fr: 432 ← [Scop: 483 (Clavaria)]
 palmatus (Agaricus) Fr: 186, M: 51, P: 430, SA: 561 ← [BH: pl. 216+] [BH: pl. 216+]
 palmatus (Pleuropus) G: 615 ← [BH: pl. 216+ (Agaricus)]
 palomet (Agaricus) SA: 591, L: 474 ← [Thor: 477]
 paludosa (Mitrella) Fr: 491 ← [LIL 3: 664]
 pannosa (Thelephora) Fr: 430 ← [S: p.f.pl. 155 (Hevella)]
 pannosus (Agaricus) Fr: 261, sp. nov.
 pannosus (Agaricus) Fr: 64, nom. nov.
 pantherina (Lepiota colubrina [var.]) G: 602, var. nov.
 pantherinus (Agaricus) Fr: 16 ← [DC 6: 52]
 panuoides (Agaricus) Fr: 273 ← [FO 2: 227]
 papilionaceus (Agaricus) Fr: 301, SA: 568, N&B: 322 ← [BH: 428, pls. 58, 561, fig. 2
 ("Papilionaceus")]
 papilionaceus (Coprinus) G: 633 ← [BH: 428, pls. 58, 561, fig. 2 (Agaricus
 "papilionaceus")]
 papillaris (Peziza) G: 666, M: 22, SA: 532 ← [BH: 244, pl. 467, fig. 1]
 papillatus (Agaricus) Fr: 312, as "A. COPR." ← [BEFC 1: 81]
 papillionaceus (Agaricus) M: 58 ← [BH: 428, pls. 58, 561, fig. 2]
 papillosa (Sphaeria) P: 493 ← [S: p.f.pl. 236]
 papyraceum (Hydnum) Fr: 413 ← [JColl 1: 345]
 papyraceus (Agaricus) Fr: 305 ← [PS: 425]
 papyraceus (Hypochnus) Schl: 58, sp. nov.
 papyraceus (Prunulus) G: 631 ← [PS: 425 (Agaricus)]
 papyrina (Auricularia) P: 455, M: 35 ← [BH: 279, pl. 402]
 papyrina (Thelephora) SA: 543 ← [BH: 279, pl. 402 (Auricularia)]
 parabolium (Asteroma) G: 523 ← [TM 2: 43 (Sphaeria)]
 paradoxum (Hydnum) Fr: 424 ← [Schr: 179]
 parallelum (Peripherostoma) G: 515 ← [S: p.f.pl. 374 (Sphaeria)]
 parasitica (Merulius) P: 179 ← [S: p.f.pl. 343 (Agaricus)]
 parasiticum (Hydnum) Schl: 58 ← [LSppl: 1648]
 parasiticus (Agaricus) Fr: 135, M: 75 ← [BH: 609, pl. 574, fig. 2]
 parasiticus (Boletus) Fr: 389, M: 46 ← [BH: 317, pl. 451, fig. 1]
 parasiticus (Gymnopus) G: 610 ← [BH: 609, pl. 574, fig. 2 (Agaricus)]
 pargamenus (Agaricus) Fr: 76 ← ["Swartz. Vetensk. Akad. Handl. 1809: 90"]
 paridicola (Sphaeria lichenoides var.) M: 146, var. nov.

- parietina (Byssus) M: 11, SA: 525 ← [DC 2: 66+] [DC 2: 66+ (Byssus)]
 parietina (Himantia) LD 21: 164 ← [DC 2: 66+ (Byssus)]
 parilis (Agaricus) Fr: 168 ← [FO 2: 214]
 parvus (Agaricus) H: 22 ← [With: 237]
 pascuus (Agaricus) Fr: 205 ← [PS: 427 ← PCS: 94]
 pascuus (Agaricus pratella) Z: 313+ ← [PS: 427 ← PCS: 94 (Agaricus)]
 patella (Sphaeria) Schl: 59, H: 7 ← [PS: 76 (Sphaeria)] ← TM 2: 45 (Sphaeria
 penetrans var.)
 patellaria (Peziza) L: 466, M: 20 ← [PS: 670]
 patellarise (Peziza) SA: 530 ← [PS: 670 ("Patellaria")]
 patens (Rhizomorpha) P: 306 ← [S: p.f.pl. 392, fig. 1]
 patula (Morchella) G: 662 ← [GSN: 1449 (Phallus)]
 patulus (Dasyscyphus) G: 671 ← [POM 1: 42 (Peziza)]
 pectinatum (Hydnum) Fr: 412, nom. nov.
 pectinaceus (Agaricus) N&B: 327, R: 26 ← [BH: 599; pl. 509]
 pectinatus (Agaricus) SA: 561, M: 52 ← [BH: 599, pl. 509 ("pectinaceus")]
 pediades (Agaricus) Fr: 290, sp. nov.
 pedicularis (Agaricus variabilis var.) M: 51, var. nov.
 pedunculatum (Hypoxylon) G: 512 ← [Dick 4: 27 (Sphaeria)]
 pelianthinus (Agaricus) Fr: 112, nom. nov.
 pellitus (Agaricus) Fr: 198 ← [PS: 366]
 pellitus (Polyporus) Fr: 362 ← [Mey: 303]
 pellopurus (Boletus) SA: 548 ← [BH: 365, pl. 501, fig. 2]
 pellospermus (Agaricus) M: 59 ← [BH: 426, pl. 561, fig. 1]
 pellucidus (Agaricus) Fr: 156, M: 68 ← [BH: 536, pl. 550, fig. 2]
 peltata (Sphaeria fusca var.) M: 139 ← [DC 2: 287 (Sphaeria)]
 penicellata (Clavaria) M: 31 ← [BH: 207, pl. 448, fig. 3]
 penicillata (Clavaria) SA: 539 ← [BH: 207, pl. 448, fig. 3]
 penicillata (Monilia) M: 14, sp. nov.? [PCC: 96 (Merisma)]
 penicillata (Thelephora) Fr: 434 ← [A&S: 261]
 pendulum (Hydnum) Fr: 413, not 414 ← [PS: 427 ← PCS: 94]
 pennatus (Agaricus) Fr: 297, sp. nov.
 perennis (Boletus) Schl: 56, M: 43, N&B: 336, P: 449 ← [LSpPl: 1646]
 perennis (Macroscyphus) G: 672 ← [PS: 644 (Peziza)]
 perennis (Polyporus) Fr: 350 ← [LSpPl: 1646 (Boletus)]
 perforans (Agaricus) Fr: 138 ← [Hoffmann. Nomencl. Fung. pl. 4, fig. 2"]

- perforans (Micromphale) G: 622 ← [Hoffmann. Nomencl. Fung. pl. 4, fig. 2" (Agaricus)]
 periza (Sphaeria) N&B: 299 ← [TM 2: 46 ("peziza")]
 peronatus (Agaricus) Fr: 126, M: 74, P: 207 ← [Bolt: 58, pl. 58]
 peronatus (Gymnopus) G: 607 ← [Bolt: 58, pl. 58 (Agaricus)]
 perpendicularis (Agaricus) SA: 572, M: 64 ← [BH: 469, pl. 422, fig. 2]
 perpusillus (Agaricus) Fr: 192 ← [LUNN: 523]
 persicinus (Agaricus) Fr: 52, sp. nov.
 persistens (Tremelia) SA: 536, M: 28 ← [BH: 223, pl. 304]
 personatus (Agaricus) Fr: 50 ← [FO 2: 89]
 personii (Agaricus) Fr: 27 ← [FO 2: 7]
 personii (Auricularia) M: 36 ← [DC 2: 107 (Thelephora "persoonii")]
 perula (Polyporus) Fr: 349 ← [PFO: 14, pl. 8 (Microporus)]
 pes caprae (Polyporus) Fr: 354 ← [Pr: 241]
 pessundatus (Agaricus) Fr: 38, not 138, nom. nov.
 petaloides (Agaricus) N&B: 331, M: 51 ← [BH: 391, pls. 226, 557, fig. 2 ("petalodes")]
 petiginosus (Agaricus) Fr: 259, nom. nov.
 petroselinii (Albugo) G: 540 ← ["LDC: 49 (Uredo)"]
 peziza (Sphaeria) H: 7, M: 143 ← [TM 2: 46]
 pezizaeformis (Sphaeria) G: 526 ← [TM 2: 46 ("peziza")]
 pezizoides (Agaricus) Fr: 276 ← ["Nees. Act. Nat. Cur. 9: 249"]
 pezizoides (Xyloma) G: 546 ← [PS: 105]
 phacorhiza (Clavaria) G: 658, P: 268 ← [Reich: 315]
 phacorhiza (Typhula) Fr: 495 ← [Reich: 315 (Clavaria)]
 phaioccephalus (Agaricus) M: 76, SA: 579 ← [BH: 607, pl. 555, fig. 1]
 phaioccephalus (Agaricus) Fr: 46 ← [BH: 607, pl. 555, fig. 1 ("phaioccephalus")]
 phaiopodius (Agaricus) M: 75 ← [BH: 622, pl. 532, fig. 2]
 phajopodius (Agaricus) Fr: 122 ← [BH: 622, pl. 532, fig. 2 ("phaiopodius")]
 phalloides (Agaricus) Fr: 13, nom. nov.
 phiala (Agaricus) HFD 12: t. 1730, fig. 1 ← [Sae: 297]
 philacteris (Thelephora) L: 469 ← [BH: 286, pl. 436, fig. 2 (Auricularia "phylacteris")]
 phlebophorus (Agaricus) Fr: 200 ← ["Dittmar, pl. 15"]
 pholideus (Agaricus) Fr: 219 ← ["Fries" Lil: 645]
 phonospermus (Agaricus) M: 76, N&B: 314 ← [BH: 568, pls. 534, 590, 547, fig. 1]
 phosphorea (Auricularia) P: 456 ← [LSpPl: 1638]
 phylacteris (Auricularia) M: 35 ← [BH: 286, pl. 436, fig. 2]

- phylacteris (Thelephora) SA: 544 ← [BH: 286, pl. 436, fig. 2 (Auricularia)]
 phyllophilus (Agaricus) Fr: 83 ← [PS: 457]
 physaloides (Agaricus) M: 64 ← [BH: 420, pl. 566, fig. 1]
 physumae (Asteroma) M: 151 ← [DC 6: 162]
 picaceus (Agaricus) Fr: 308, M: 55, P: 233, SA 566 ← [BH: 407, pl. 206]
 picaceus (Coprinus) G: 634 ← [BH: 407, pl. 206 (Agaricus)]
 picea (Nemania) G: 516 ← [S: p.f.pl. 374 (Sphaeria)]
 picea (Sphaeria) FSS: no. 194 ← [PS: 31] Fr 2: 431
 piceae (Monilia) Schl: 58 ← ["Funk"]
 picreus (Agaricus) Fr: 239, R: 37 ← [PID: 14]
 pictus (Agaricus) Fr: 166 ← [FO 1: 83]
 pileo flavido (Agaricus androsaceus var.) M: 61†
 pileolarius (Agaricus) P: 393, M: 69 ← [BH: pl. 400 + index †]
 pileus brownish (Amanita muscaria [var.]) H: 19†
 pileus orange-red (Amanita muscaria [var.]) H: 19†
 pillicare (Hysterium) Schl: 58 ← [PD: 5 ("pulicare")]
 pilifera (Sphaeria) M: 143 ← [DC 2: 300] Fr 2: 472
 piliforme (Stilbum) G: 563 ← [PAB: 31]
 pilipes (Agaricus) Fr: 154 ← [S: p.f.pl. 249]
 pilipes (Gymnopus) G: 611 ← [S: p.f.pl. 249 (Agaricus)]
 pilosa (Sphaeria) Schl: 59 ← [PID: 41]
 pilosus (Agaricus) P: 429 ← [S: p.f.pl. 164 ← HFA: 622]
 piluliformis (Agaricus) SA: 584, M: 84, P: 234 ← [BH: pl. 112 + index †]
 pinastri (Hydnum) Fr: 417 ← [FO 1: 149 ← FNS 2: 38]
 pinastri (Hypoderma) M: 152 ← [PS: xxvii ← Schrader, J. Bot.: 69 (Hysterium)]
 pinastri (Hysterium) Schl: 58, H: 8 ← [Schrader, J. Bot.: 69]
 pinastri (Peziza) Schl: 58 ← [POM2: 83]
 pinastri (Sphaeria) FSS no. 190 ← [DC 6: 133]
 pineti (Helvella) LD 20: 510 ← [LSp1: 1649]
 pinguis (Peziza) M: 21 ← [BH: pl. 396, fig. 1†]
 pini (Daedalea) Fr: 336 ← [Brot: 468 (Boletus)]
 pini (Phacidium) FSS no. 163, sp. nov. Fr 2: 573
 pini (Thelephora) Fr: 443, not 434, Schl: 60 ← [FO 1: 154 ← "Schleicher"]
 pinarius (Agaricus) Fr: 85 ← [Bosc: 84]
 pinicola (Polyporus) Fr: 372 ← ["Swartz, Obs. Bot.: 88" (Boletus)]

- pinsitus (Agaricus) Fr: 184, sp. nov.
 piperatum (Leccinum) G: 647 ← [BH: 318, pl. 451, f. 2 (Boletus)]
 piperatus (Agaricus) Fr: 76†, R: 27, SA: 562 ← [POM 2: 40 (Lactarius)]
 piperatus (Agaricus) H: 52† ← [BH: 601, pl. 292]
 piperatus (Agaricus) H: 20† ← [WBA: 299]
 piperatus (Agaricus acris var.) M: 53 ← [POM 2: 40 (Lactarius)]
 piperatus, (Agaricus lactifluus) Z: 314† ← [POM 2: 40 (Lactarius)]
 piperatus (Boletus) Fr: 388, SA: 555, M: 45 ← [BH: 318, pl. 451, fig. 2]
 piperatus (Lactarius) G: 623 ← [Bolt: 21, pl. 21 (Agaricus)]
 pisi (Erysibe) G: 589 ← [DC 2: 274 (Erysiphe)]
 pisi (Erysiphe) M: 132, SA: 614 ← [DC 2: 274]
 pistillaris (Clavaria) Fr: 477, SA: 538, G: 658, H: 30, P: 472, M: 30 ← [LSP1: 1651]
 pithya (Excipula) FSS no. 172 ← ["Fr. no. 14"] Fr 2: 184
 pithya (Feziza) Schl: 58 ← [PID: 43]
 pityrius (Agaricus) Fr: 268 ("pityreus" of index), sp. nov.
 placidus (Agaricus) Fr: 202 ← [FO 2: 94]
 plana (Tremella) Schl: 60 ← [Roth: 556 ← WH: 95]
 planus (Agaricus) HFD 12: t. 1733 ← [Sae: 346]
 planus (Agaricus) Fr: 127, sp. nov.
 platanoides (Sphaeria) FSS no. 186 ← [PS: 45] Fr 2: 404
 platyspora (Grifola) G: 643, sp. nov. (non Boletus)
 platyphylus (Agaricus) Fr: 117 ← [POM 1: 47]
 platypus (Agaricus) Fr: 154 ← [NS: 202 (Agaricus mycena)]
 pleopodius (Agaricus) Fr: 207, M: 80 ← [BH: 566, pl. 556, fig. 2]
 plexipes (Agaricus) Fr: 146, nom. nov.
 plicatilis (Agaricus) Fr: 312 (as "A. COPR. _____") ← [S: p.f.p. 364 ← CFL 3: pl. 200 + text]
 plicatilis (Agaricus) P: 427, H: 24, P: 231† ← [S: p.f.p. 364 ← CFL 3: pl. 200 + text]
 plicatus (Agaricus striatus var.) M: 58 ← [Sch 4: 15, pl. 31 (Agaricus)]
 plicatus (Agaricus coprinus) Z: 111† ← [Sch 4: 15, pl. 31 (Agaricus)]
 plicatus (Coprinus) G: 634 ← [Sch 4: 15, pl. 31 (Agaricus)]
 plumbeus (Agaricus) Fr: 73†, H: 30, M: 54 ← [BH: 498, pls. 282, 559, fig. 2]
 plumbeus (Agaricus muscarius var.) P: 203 ← [Sch 4: 37, pls. 85, 86 (Agaricus)]
 plumbeus (Agaricus lactifluus) Z: 318† ← [BH: 498, pls. 282, 559, fig. 2 (Agaricus)]
 plumbeus (Lactarius) G: 625 ← [BH: 498, pls. 282, 559, fig. 2 (Agaricus)]

- plumosus (Agaricus) Fr: 256 ← [Bolt: 33, pl. 33]
 plumosus (Gymnopus) G: 609 ← [Bolt: 33, pl. 33 (Agaricus)]
 pluteus (Agaricus) Fr: 199 ← [BEF: 79]
 pluvius (Agaricus) Fr: 236, sp. nov.
 podagrariae (Sphaeria) FSS: no. 192 ← ["Roth" (not catal.)] Fr 2: 556
 poliota (Sphaeria) FSS: no. 198, sp. nov., Fr 2: 512, Fr 3: 251
 politus (Agaricus) Fr: 209 ← [PS: 465]
 polycephalus (Boletus) K: 26 ← [PS: 520]
 polygonati (Asteroma) M: 151 ← [DC 6: 163]
 polygoni (Erysibe) G: 589 ← [DC 2: 273 (Erysiphe)]
 polygoni (Erysiphe) SA: 614, Re: 55, M: 132 ← [DC 2: 273]
 polygonia (Auricularia) M: 35 ← [PS: 574 (Thelephora)]
 polygonia (Thelephora) Fr: 444, SA: 544 ← [PS: 574]
 polygramma (Sphaeria) FSS no. 196, sp. nov., Fr 2: 432
 polygramma (Mycena) G: 619 ← [BH: pl. 395 + index + (Agaricus)]
 polygrammus (Agaricus) Fr: 146, M: 63 ← [BH: pl. 395 + index + (Agaricus)]
 polygrammus (Agaricus varius var.) P: 217 ← [BH: pl. 395 + index + (Agaricus)]
 polygrammus (Agaricus mycena) Z: 105 + ← [BH: pl. 395 + index + (Agaricus)]
 polymorpha (Microsphaeria) Tdb: 9, footnote, sp. nov.?
 polymorpha (Peziza) P: 464+ ← [WBA: 444]
 polymorpha (Sphaeria) SA: 520, H: 4 ← [POM 2: 64]
 polymorphum (Geoglossum) G: 659 ← [S: p.f.p. 276 (Clavaria)]
 polymorphum (Hypoxylon) G: 512, M: 138 ← [POM 2: 64 (Sphaeria)]
 polymyces (Agaricus (Lepiota)) K: 11 ← [PS: 269 ← PD: 19]
 polymyces (Agaricus (Lepiota)) G: 603 ← [PS: 269 (Agaricus) ← PD: 19 (Agaricus)]
 polyphyllus (Agaricus) Fr: 43 ← [DC 6: 50]
 polyporus (Boletus) SA: 553, M: 44 ← [BH: 331, pl. 469]
 pomaceus (Boletus) G: 642 ← [PS: 538 (B. fomentarius var. _____)]
 pomposus (Agaricus) P: 225 ← [Bolt: 5, pl. 5]
 popinalis (Agaricus) Fr: 194, sp. nov.
 populi (Erineum) Schl: 57 ← ["persoon?"] (Variant of "populinum?")
 populi (Erysibe) G: 589 ← [DC 6: 104 ← "LDC: no. 733"]
 populi (Erysiphe) M: 132, SA: 615 ← [DC 6: 104 ← "LDC: no. 733"]
 populi (Periherostoma) G: 515 ← [S: p.f.p. 374, fig. 2+ (Sphaeria)]
 populi (Sphaeria) Schl: 59, sp. nov.

- populicola (Sphaeria lichenoides var.) M: 146, var. nov.?
 populina (Nemospora) Schl: 58 ← [PS: 109 (Naemaspora)]
 populina (Erineum) P: 315, M: 17 ← [PS: 700 ← POM 1: 100]
 populinum (Sclerotium) M: 130, Schl: 59 ← [POM 2: 25 "populneum"]
 populinum (Xyloma) Schl: 60, SA: 519 ← [PS: 107]
 populinum ([Xyloma]) M: 150+ ← [PS: 107]
 populinus (Polyporus) Fr: 367 ← [Sae: 384 (Boletus)]
 populnea (Patellaria) G: 664 ← [PS: 671 (Peziza) ← PD: 35 (Peziza)]
 populneum (Sclerotium) SA: 618 ← [PS: 125 ← POM 2: 25]
 poriaeformis (Peziza) M: 22 ← [DC 6: 26 ← PS: 656 (Peziza anomala var. _____)]
 porinoides (Merulius) Fr: 329 ← [FO 2: 237]
 poronia (Sphaeria) Schl: 59 ← [PCC: 19]
 poronia (Sphaeria) H: 5 ← [PCC: 19]
 porphyrius (Agaricus) Fr: 14 ← [A&S: 142 (Amanita)]
 porrea (Mycena) G: 619 ← [PS: 376 (Agaricus)]
 porreus (Agaricus) Fr: 128 ("porrens" of index) ← [FO 2: 152]
 porreus (Agaricus mycena) Z: 102+ ← [PS: 376 (Agaricus)]
 porrigens (Agaricus) Fr: 184 ("porrigeus" of index) ← [POM 1: 54]
 portentosus (Agaricus) Fr: 39, sp. nov.
 potentillae (Astroma) G: 525 ← [S: p.f.p. 370, fig. 2+ (Sphaeria)]
 praecox (Agaricus) Fr: 282 ← [PCS: 89]
 prasiomus (Agaricus) Fr: 148 ← [FO 2: 153]
 pratensis (Agaricus) Fr: 99, HFD 12: t. 1731, fig. 1 ← [PS: 304]
 pratensis (Clavaria) Fr: 471 ← [PCC: 51]
 pratensis (Gymnopus) G: 604 ← [PS: 304 (Agaricus)]
 pratensis (Ramaria) G: 655 ← [PCC: 51 (Clavaria)]
 precoc (Agaricus pratelia) Z: 307+ ← ["Batsch, p. 77" (not found)]
 primula (Agaricus) P: 215 ← [With: 238]
 probiscideus (Agaricus) Fr: 274 ← [FO 2: 232]
 procerus (Agaricus) Fr: 20, not 80, L: 475, H: 23, N&B: 308, P: 418, R: 39 ← [Scop: 418]
 procera (Lepiota) G: 601 ← [Scop: 418 (Agaricus)]
 profuga (Sphaeria) Spr: 310 ← [Ehor: 92]
 profusa (Nemaspora) G: 531 ← [S: p.f.p. 377 (Sphaeria)]
 profusa (Sphaeria) P: 278 ← [S: p.f.p. 377]

- proliferus (*Agaricus fistulosus* var.) M: 63, var. nov.
 proluxus (*Agaricus*) Fr: 120, nom. nov.
 proteus (*Agaricus*) SA: 583 ← [BH: 650]
 proteus (*Agaricus araneosus* var.) M: 82, SA: 583 ← [BH: pl. 431, figs. 2, 3+]
 protracta (*Nemania*) G: 518 ← [PS: 34 (*Sphaeria*)]
 prunastri (*Erysiphe*) M: 134 ← [DC 6: 108]
 prunastri (*Patellaria*) G: 664 ← [PS: 673 (*Peziza*) ← PD: 35?]
 prunastri (*Peziza*) M: 20, H: 33 ← [PS: 673]
 prunastri (*Sphaeria*) H: 6 ← [PS: 37]
 prunastri (*Boletus pomaceus* [var.]) G: 642 ← [PS: 538+]
 prunuloides (*Agaricus*) Fr: 198, sp. nov.
 prunulus (*Agaricus*) Fr: 193+, not 191, N&B: 328 ← [Scop: 437]
 prunulus (*Agaricus omphalia*) Z: 347+ ← [Scop: 437 (*Agaricus*)]
 psammocephalus (*Agaricus*) N&B: 311, M: 81 ← [BH: 655, pl. 531, fig. 2, pl. 586, fig. 1]
 pseudo-androsaceus (*Agaricus*) SA: 573, M: 67 [BH: 539, pl. 276 "pseudo-androsaceus"]
 pseudo-androsaceus (*Agaricus*) P: 185 ← [BH: 539, pl. 276]
 pseudo-aurantiacus (*Agaricus*) M: 87 ← [BH: 673, pl. 122]
 pseudo-boletus (*Hydnum*) Fr: 424, ("pseudoboletus" of index), L: 469 ← [DC 6: 37
 ("pseudoboletus")]
 pseudo-igniarius (*Boletus*) SA: 550 ← [BH: 356, pl. 458]
 pseudo-igniarius (*Boletus*) P: 244, N&B: 338, M: 41 ← [BH: 356, pl. 458]
 pseudo-mouceron (*Agaricus*) SA: 576 ← [BH: 578, pl. 144, 528, fig. 2]
 pseudo-mouceron (*Agaricus*) M: 80 ← [BH: 578, pl. 144, 528, fig. 2]
 pseudo-platani (*Xyloma*) M: 149 ← [DC 6: 152] "Hoppe, des. 1, no. 2"
 psittacinus (*Agaricus*) Fr: 102, P: 415 ← [Sch 4: 70, pl. 301]
 psittacinus (*Agaricus gymnopus*) Z: 97+ ← [Sch 4: 70, pl. 301 (*Agaricus*)]
 pteridis (*Sclerotium*) Schl: 59 ← ["P[erson]"]
 pteridis (*Xyloma*) M: 149 ← [DC 6: 154]
 pterigenus (*Agaricus*) Fr: 160, not 100 ← [FO 1: 43]
 pubescens (*Polyporus*) Fr: 367 ← [Sae: 384 (*Boletus*)]
 pubescens (*Sclerotium*) SA: 617 ← [DCM 1815: 412]
 puccineola (*Sphaeria*) Schl: 59 ← ["De Candolle" (not found)]
 puccinioides (*Conoplea*) M: 16 ← [DC 2: 73]
 pudens (*Gymnopus*) G: 605 ← [PS: 313 (*Agaricus radiatus* var. ____)]

- pudicus (Agaricus) M: 86 ← [BH: 635, pl. 597, fig. 2]
 pudorinus (Agaricus) Fr: 33, sp. nov.
 puella ([Agaricus] pseudo-aurantiacus var.) M: 87 ← [BEF: 59 (Agaricus)]
 pulchella (Peziza) M: 33, Schl: 58 ← [PS: 653]
 pulchella (Sphaeria) FSS no. 146 ← [PD: 3] Fr 2: 406
 pulchellum (Circinostoma) G: 521 ← [PD: 3 (Sphaeria)]
 pulchellus (Dasyscyphus) G: 670 ← [PS: 653 (Peziza)]
 pulcher (Agaricus coprinus) Z: 110+ ← [PD: 63 (Agaricus)]
 pulcher (Coprinus) G: 635 ← [PD: 63 (Agaricus)]
 pulicare (Hysterium) P: 319, G: 510, LD 22: 400, M: 153, SA: 515, H: 8 ← [PD: 5]
 pullatus (Coprinus cinereus [var.]) G: 634 ← [Bolt: 20, pl. 20 (Agaricus)]
 pulmonarius (Agaricus) Fr: 187, sp. nov.
 pulveracea (Sphaeria) M: 145 ← [DC 2: 297 ← PS: 83]
 pulverulentus (Agaricus) SA: 570, M: 59, N&B: 323, R: 34 ← [BH: pl. 178 + index+]
 pulvinatum (Corynium) Schl: 57 ← ["Kunz"]
 pulvinatum (Coryneum) FSS no. 213 ← [no reference: sp. nov.?]
 pulvinatum (Helicotrichum) LD 20: 461 ← ["Nees, nov. Acta Cur. 9: 146"]
 pulvinatus (Agaricus) Fr: 180 ← [PS: 370]
 pulvis pyrius (Sphaeria) H: 8+, Schl: 59+ ← [PD: 51 (Sphaeria pulvis)] Fr 2: 458
 pumulis (Agaricus) Fr: 263, SA: 573, N&B: 318, M: 65 ← [PS: 317]
 punctata (Sphaeria) M: 140, SA: 522 ← [LSP: 1180 (Peziza)]
 punctatum (Xyloma) M: 149, RVS: 345, Spr: 279 ← [POM 2: 100] Fr 2: 569 (Rhytisma)
 punctiforme (Astroma) G: 524 ← [PAB 5: 26 (Sphaeria)]
 punctiformis (Aegerita) M: 15 ← [DC 2: 72]
 punctiformis (Byssocladium) G: 552 ← [RC 3: 220 (Conferva)]
 punctiformis (Sphaeria) Schl: 59, N&B: 300, H: 8, SA: 523 ← [PAB: 26] Fr 2: 525
 punctulatum (Xyloma) M: 149 ← [DC 6: 157+]
 punicea (Peziza) P: 262 ← [BEFC 2: 97]
 puniceus (Agaricus) Fr: 104, nom. nov.
 purpureascens (Agaricus) Fr: 34 ← [A&S: 182]
 purpurea (Clavaria) Fr: 480 ← [Müller, FD 14: pl. 837 + text]
 purpurea (Thelephora) Fr: 440+, H: 29 ← [PS: 592 (Thelephora) ← PD: 30 (Stereum)]
 purpureo-albus (Agaricus roseus var.) P: 224, nom. nov.
 purpureo-fuliginus (Agaricus russula) Z: 353+ ← [PS: 444 (Agaricus russula nitidus
 var. _____)]

- purpureo-fuscus (*Agaricus fascicularis* var.) P: 225, var. nov.
 purpureum (*Erineum*) FBR: 40, Schl: 57, M: 17 ← ["DC, Encycl. Bot. 8: 218"]
 purpureum (*Erineum fagineum* var.) M: 16, var. nov.
 purpureus (*Agaricus*) Fr: 228, M: 82 ← [PS: 290 ← BH†]
 purpureus (*Agaricus purus* var.) M: 72 ← [Bolt: 41, pl. 41b (*Agaricus*)]
 purpureus (*Agaricus purus* [var.]) G: 608 ← [Bolt: 41, pl. 41b (*Agaricus*)]
 purpureus (*Polyporus*) Fr: 379, nom. nov.
 purus (*Agaricus*) Fr: 151, M: 72 ← [PD: 21]
 purus (*Gymnopus*) G: 608 ← [PD: 21 (*Agaricus*)]
 pusilla (*Peziza*) Schl: 58 ← [Ach[arius]] Fr: 2: 143
 pusilla (*Mitrella*) Fr: 493† (as "M. heyderia") ← [NS: 173 (*Leotia*)]
 pusilla (*Pistillaria*) Fr: 498, not 298 ← [PCC: 36]
 pusillum (*Hydnum*) Fr: 407 ← [Brot: 470]
 pusillum (*Agaricus*) Fr: 264†, sp. nov.
 pusillus (*Agaricus*) Fr: 279†, N&B: 306, M: 89 ← [POM 2: 36 (*Amanita*)]
 pusillus (*Cantharellus*) Fr: 321 ← [FO 2: 234 (*Merulius*)]
 pustula (*Sclerotium*) SA: 618 ← [DC 6: 113†]
 pustula (*Sphaeria*) FSS: no. 205 ← [PAB: 26] Fr: 2: 547
 pustulata (*Scodellina*) G: 669 ← [PS: 646 ← "Hedwig, Musc. pl. 6A" (*Octospora*)]
 pustulata (*Sclerotium*) M: 130 ← [DC 6: 113 "pustula"]
 pustulata (*Sphaeria*) SA: 522 ← [HV 1: 26]
 pustulatum (*Ascoma*) G: 526 ← [S: p.f.p. 370 (cf. S: p.f.p. 375, fig. 1, "pustula var. minuta")]
 pustulatum (*Engizostoma*) G: 520 ← [HV 1: 26 (*Sphaeria*)]
 pustulatus (*Agaricus*) Fr: 34 ← [PS: 354]
 pustullata (*Sphaeria*) M: 142 ← [HV 1: 26 "pustulata"]
 puteana (*Thelephora*) Fr: 448 ← [Sae: 397]
 putillis (*Agaricus*) Fr: 129 ← [FO 2: 130]
 putredinus (*Sphaeria byssiseda* var.) M: 144 ← [DC 2: 296†]
 pyri (*Erineum*) Schl: 57 ← [PD: 43 "pyrinum"]
 pygmeus (*Agaricus*) Fr: 263, M: 65 ← [BH: 437, pl. 525, fig. 2]
 pyracanthae (*Erineum*) SA: 529 ← [DC 6: 13]
 pyriformis (*Agaricus*) Fr: 158 ← [PS: 317]
 pyriformis (*Stilbospora*) FSS no. 214 ← [Hoffm[ann?]]
 pyrinum (*Erineum*) R: 315 ← [PD: 43]
 pyriodorus (*Agaricus*) Fr: 255 ← [PD: 300]

- pyrogalus (Agaricus) Fr: 74, SA: 564, R: 27, M: 54 $\leftarrow$ [BH: 487, pl. 529, fig. 1]
 pyrrosperrmus (Agaricus) M: 79 $\leftarrow$ [BH: 571, pl. 547, fig. 3]
 pyxidata (Clavaria) Fr: 470 $\leftarrow$ [PCC: 47]
 pyxidata (Scodellina) G: 669 $\leftarrow$ [Sch 4: 111, pl. 280 (Elvela)]
 pyxidatus (Agaricus) Fr: 164, not 185, M: 68 $\leftarrow$ [BH: 514, pl. 568, fig. 2]
- Q --
- quaternata (Sphaeria) P: 288 $\leftarrow$ [POM 1: 64 (Sphaeria)]
 quaternatum (Circinostoma) G: 521 $\leftarrow$ [POM 1: 64 (Sphaeria)]
 quercinaria (Sphaeria punctiformis var.) M: 146, var. nov.
 quercicola (Sphaeria lichenoides var.) M: 146, var. nov.
 quercina (Daedalea) Fr: 333, N&B: 333, G: 638, P: 247, Schl: 57, H: 26 $\leftarrow$ [LSP: 1176 (Agaricus)]
 quercina (Nemania) G: 518 $\leftarrow$ [PD: 2 (Sphaeria)]
 quercina (Sphaeria) FSS no. 143 $\leftarrow$ [PD: 2] Fr 2: 362
 quercina (Thelephora) Fr: 442, Schl: 60 $\leftarrow$ [PS: 573]
 quercinum (Corticium) G: 653 $\leftarrow$ [PS: 573 (Thelephora)]
 quercinum (Erineum) Schl: 57, sp. nov.
 quercinum (Hypoderma) G: 509, M: 153, SA: 515, LD 22: 370 $\leftarrow$ [PS: 100 (Hysterium) POM 1: 83 (Hysterium)]
 quercinum (Sclerotium) G: 591, Schl: 59 $\leftarrow$ [PS: 124 $\leftarrow$ PD: 15]
 quercinum (Sistotrema) N&B: 340 $\leftarrow$ [PS: 552 (Sistotrema) $\leftarrow$ POM 2: 17 (Odontia)]
 quercinum (Steccherinum) G: 651, sp. nov.
 quercinum (Xylodon) G: 649 $\leftarrow$ [PS: 552 (Sistotrema) $\leftarrow$ POM 2: 17 (Odontia)]
 quercinus (Agaricus) L: 471, M: 49, P: 435 $\leftarrow$ [LSP: 1176]
 quietus (Agaricus) Fr: 69, nom. nov.
 quisquiliaris (Pistillaria) Fr: 497, not 297 $\leftarrow$ [FO 2: 294 (Clavaria)]

-- R --

- racemosa (Botrytis) SA: 527, M: 14 $\leftarrow$ [BH: 104, pl. 504, fig. 7 (Mucor)]
 racemosa (Monilia) SA: 527 $\leftarrow$ [PD: 41]

- racemosa* (Mycena) G: 620 ← [PS: 389 (Agaricus) ← [S: p.f.p. 287 (Agaricus)].
racemosa (*Monilia penicillata* var.) M: 14+ ← [BH: 104, pl. 504, fig. 7 (Mucor ____)]
racemosus (Agaricus) Fr: 134 ← [PS: 389]
radia (Peziza) M: 24 ← [POM 2: 78 ("badia")]
radians (*Himantia*) LD 21: 165 ← ["Pers[oon?]"]
radiata (*Phlebia*) Fr: 427, sp. nov.
radiata (*Stictus*) G: 663 ← [LSpP1: 1654 (Lycoperdon)]
radiatus (Agaricus) Fr: 313 (as "A. COPR. ") ← [Bolt: 39, pl. 39C]
radiatus (Agaricus coprinus) Z: 109+ ← [Bolt: 39, pl. 39C (Agaricus ____)]
radiatus (Coprinus) G: 635 ← [Bolt: 39, pl. 39C (Agaricus)]
radiatus (Hymenoscyphus) G: 673 ← [PS: 662 (Peziza)]
radiatus (Polyporus) Fr: 369 ← [S: p.f.p. 196 (Boletus)†]
radicans (Boletus) Fr: 390 ← [PS: 507]
radicans (*Helotium*) LD 20: 509 ← [A&S: 348]
radicatus (Agaricus) Fr: 118, P: 407 ← [Rels 1: 28]
radicatus (Agaricus gymnopus) Z: 93+ ← [Rels 1: 28 (Agaricus ____)]
radicatus (Gymnopus) G: 605 ← [Rels 1: 28 (Agaricus)]
radicatus (*Macroscyphus*) G: 671 ← [Dickson and "Reichard, Beschäft Berlin Gesellsch.
3: 214" (Peziza)]
radicosa (*Sphaeria*) SA: 519 ← [BH: 195, pl. 440, fig. 2 (Clavaria)]
radicosum (*Hypoxylon*) M: 137 ← [BH: 195, pl. 440, fig. 2 (Clavaria)]
radicosus (Agaricus) Fr: 242, SA: 586, M: 85 ← [BH: 637, pl. 160]
radula (*Hydnum*) Fr: 422, Schl: 58 ← [FO 2: 271]
radula (Polyporus) Fr: 383 ← [PS: 547 (Boletus) ← POM 2: 13 (Poria)]
radula (*Sphaeria*) M: 141, Schl: 59 ← [DC 2: 291 ← PS: 37]
ramaria (*Hydnum*) Fr: 410, sp. nov.
ramealis (Agaricus) Fr: 135, P: 191, M: 79, ← [BH: 538, pl. 336]
ramealis (*Gymnopus*) G: 611 ← [BH: 538, pl. 336 (Agaricus)]
ramentacea (*Typhula*) Fr: 496, sp. nov.
ramentaceus (Agaricus) Fr: 25 ← [BH: 640, pl. 595, fig. 3]
ramentaceus ([Agaricus]) M: 85 ← [BH: 640, pl. 595, fig. 3]
ramosa (*Elvela*) K: 35 ← [Sch 4: 106]
ramosissima (*Fibrillaria*) LD 21: 165 ← [S: p.f.p. 387, fig. 2]
ramosum (*Hydnum*) M: 37 ← [BH: 305, pl. 390]
ramosum (*Hypoxylon cornutum* [var.]) G: 512 ← [S: p.f.p. 395 (Sphaeria ____)]
Dick 4: 27 (Sphaeria ____)]

- ramosus (Agaricus) Fr: 95, M: 72, SA: 577 ← [BH: 591, pl. 102]
 ramosus (Boletus) M: 39 ← [BH: 349, pl. 418]
 ramosus (Mucor) SA: 601, M: 114, L: 481 ← [BH: 116, pl. 480, fig. 3]
 ramosus (Polyporus) G: 645 ← [BH: 349, pl. 418 (Boletus)]
 ramotus (Agaricus) L: 474 ← [DC 2: 178 "ramosus" ← BH: 591, pl. 102 "ramosus"]
 rancidus (Agaricus) Fr: 144, sp. nov.
 rapaeiformis (Hymenoscyphus) G: 673 ← [BH: 265 (Peziza "rapulum")]
 rapulum (Peziza) M: 24 ← [BH: 265]
 ravidus (Agaricus) Fr: 265 ← [FO 2: 132]
 recisa (Tremella) G: 593 ← ["Dittmar, Fung."]
 reductus (Agaricus) Fr: 133, not 131 ← [FO 2: 137]
 reflexa (Auricularia) M: 34, P: 454 ← [BH: 281, pl. 274, 483, fig. 1-5]
 reflexa (Thelephora) L: 469, SA: 543 ← [BH: 281, pls. 274, 483, fig. 1-5 (Auricularia)]
 reflexus (Agaricus gymnopus) Z: 99† ← [PS: 311 (Agaricus _____)]
 reflexus (Gymnopus) G: 604 ← [PS: 311 (Agaricus)]
 relacinus (Agaricus) Fr: 256, sp. nov.
 reniformis (Agaricus) Fr: 191, P: 239 ← [Mey: 302]
 repandum (Dentinum) G: 650 ← [LSP: 1178 (Hydnum)]
 repandum (Hydnum) Fr: 400, M: 38, LD 22: 93, P: 450, N&B: 341, H: 28, L: 469, K: 37, SA: 545
 ← [LSP: 1178]
 repandus (Agaricus) Fr: 255, M: 79, SA: 578 ← [BH: 586, pl. 423, fig. 2, pl. 579, fig. 1]
 repens (Agaricus) M: 75 ← [BH: pl. 90 + index†]
 resinosus (Polyporus) Fr: 361 ← [Schr: 171 (Boletus)]
 replaxus (Agaricus) Fr: 158†, sp. nov.
 resinus (Agaricus) Fr: 75 ← ["FO 1: 58 "(not found)]
 reticulatus (Agaricus) Fr: 238 ← [PID: 13]
 reticulatus (Polyporus) Fr: 385 ← [NS (Ueberblick): 59 (Boletus)]
 retirugis (Cantharellus) Fr: 324 ← [BH: 289, pl. 498, fig. 1 (Helvella)]
 retirugis (Merulius) SA: 557, M: 48 ← [PS: 494 (Merulius) ← BH: 289, pl. 498, fig. 1 (Helvella)]
 rhagadiosus (Agaricus) Fr: 30, sp. nov.
 rhaphanoides (Agaricus) Fr: 230 ← [PS: 324 "raphanoides"]
 rhodopolius (Agaricus) Fr: 197, HFD 13: + 1736
 rhodellus (Polyporus) Fr: 380 ← [FO 2: 261]
 rhodosporum (Actinocladium) LD 20: 497 ← [Ehrenberg, "Jahrb. Gewaechs. 1819, 1: 52"]

- rhodostomum (Exormatostoma) G: 522 ← [A&S: 43 (Sphaeria)]
 ribesia (Peziza) Schl: 58, M: 20 ← [PD: 35]
 ribesia (Sphaeria) H: 5 ← [PS: 14]
 ribis (Boletus) M: 40 ← [Person apud DC 6: 41]
 ribis (Peripherostoma) G: 514 ← [PS: 14 (Sphaeria "ribesia")]
 ribis (Polyporus) Fr: 375 ← [Sae: 386 (Boletus)]
 rigidum (Stilbum) M: 17 ← [PAB: 31]
 rimosa (Patellaria) G: 664 ← [S: p.f.p. 369, fig. 12 (Peziza)]
 rimosa (Sphaeria) G: 528 ← [S: p.f.p. 375, fig. 3]
 rimosa (Sphaeria) M: 140 ← [A&S: 13]
 rimosipes (Morchella) SA: 591, M: 91 ← [DC 2: 214]
 rimosus (Agaricus) Fr: 258, M: 79, P: 405, SA: 581, N&B: 312, R: 36 ← [BH: 558, pls. 388, 599]
 rimosus (Gymnopus) G: 604 ← [BH: 558, pls. 388, 599 (Agaricus)]
 rimosus (Agaricus araneosus var.) SA: 583, M: 82 ← [BH: pl. 431, fig. 4+]
 rivulosus (Agaricus) Fr: 87 ← [PS: 369]
 roboris (Sclerotium pustullata var.) M: 130, var. nov.
 robustus (Agaricus) Fr: 26 ← [A&S: 147]
 roridus (Agaricus) Fr: 156 ← [FO 1: 84]
 rosacea (Russula) G: 618 ← [PS: 439 ← Sch 4: 32 (Agaricus "roseus")]
 rosaceus (Agaricus) R: 26 ← [BH: 473, pl. 162, 507 ("roseus")]
 rosaceus (Agaricus russula) Z: 351+ ← [POM 1: 100 ← Sch 4: 32 (Agaricus "roseus")]
 rosaceus (Agaricus pectinatus var.) M: 52, comb. nov.
 rosaceus (Agaricus pectinatus [var.]) SA: 562, comb. nov.
 rosaceus (Sphaeria) Schl: 59 ← [PS: 18 "rosea"]
 rosea (Botrytis) M: 15 ← [BH: 102, pl. 504, fig. 4 (Mucor)]
 rosea (Clavaria) Fr: 482 ← [FO 2: 290 ← "Dalman, Vetensk. Akad. Handl. 1811: 157"]
 rosea (Himantia) LD 21: 165 ← [FO 1: 211]
 rosea (Peziza) M: 19 ← [POM 2: 82]
 rosea (Psilonia) FSS no. 220, sp. nov.; Fr 3: 447
 rosea (Thelephora) Fr: 451 (as "T. Himantia") ← [PS: 575 (Thelephora)]
 PD: 31 (Corticium)]
 rosea (Trichoderma) M: 16 ← [PD: 12]
 rosea (Tubercularia) SA: 616, L: 484, M: 129 ← [POM 1: 78]
 rosella (Omphalia) G: 613 ← [BEFC 1: 121]

- rosellus (Agaricus) Fr: 151 ← [FO 1: 42 "rhodellus" ← PS: 393 "roseus" ← PD: 24
 "roseus"]
 roseo-albus (Agaricus) Fr: 199 ← [Hornemann, FD 28: pl. 1679 + text]
 roseum (Fusarium) G: 547 ← [LM 3: 10]
 roseum (Hyphasma) LD 20: 517 ← [Rebentisch, "Fl. Mem.", 397"]
 roseum (Trichothecium) G: 550 ← [PS: 231 ← LM 3: 8]
 roseus (Agaricus) M: 65†, P: 224 ← [BH: 473, pls. 162, 507]
 roseus (Polyporus) Fr: 372 ← [A&S: 251 (Boletus)]
 roseus (Agaricus purus var.) M: 72† ← [BH: 473, pls. 162, 507 (Agaricus)]
 rostrata (Sphaeria) G: 530 ← [TM 2: 14]
 rotula (Agaricus) Fr: 136, L: 473 ← [Scoop: 456]
 rotula (Agaricus omphalia) Z: 346† ← [Scoop: 456 (Agaricus)]
 rubella (Clavaria) K: 33 ← [Sch 4: 119]
 rubella (Peziza chrysocoma var.) M: 21†, var. nov.
 rubeolarium (Leccinum) G: 648 ← [BH: 326, pl. 490, fig. 1 (Boletus)]
 rubeolarium (Boletus) M: 44, P: 437, SA: 554, N&B: 335, R: 23 ← [BH: 326, pl. 490, fig. 1]
 ruber (Agaricus) Fr: 58 ← ["Lam[arck]"] ← PS: 433 (Agaricus lactifluus)]
 ruber (Agaricus) L: 472, R: 26 ← [PS: 433 (Agaricus lactifluus)]
 ruber (Agaricus (Lactifluus)) K: 9 ← [PS: 433 (Agaricus lactifluus)]
 ruber (Agaricus (Russula)) K: 20, sp. nov.
 ruber (Boletus hispidus var.) M: 42 ← [BH: 351, pl. 210]
 ruber (Boletus hispidus [var.]) SA: 548 ← [BH: 351, pl. 210]
 ruber (Lactarius) G: 624 ← [PS: 433 (Agaricus lactifluus)]
 rubescens (Agaricus) Fr: 18, N&B: 307 ← [PD: 67 (Amanita)]
 rubescens (Amanita) G: 600 ← [PD: 67]
 rubescens (Daedalea) Fr: 339 ← [A&S: 238]
 rubescens (Pleuropus palmatus [var.]) G: 615, var. nov.
 rubiformis (Sphaeria) G: 528, N&B: 295 ← [S: p.f.p. 373, fig. 2]
 rubi fruticosi (Hypoderma virgultorum var.) M: 152†, var. nov.
 rubiginosa (Sphaeria) FSS no. 142 ← [PS: 11] Fr 2: 340
 rubiginosa (Thelephora) Fr: 436, H: 29 ← [Schr: 185 ← GSN: 1441]
 rubiginosum (Stereum) G: 652 ← [GSN: 1441 (Thaelephora)]
 rubra (Byssus) M: 12 ← [DC 2: 68]
 rubra (Cucurbitaria) G: 519, sp. nov.
 rubra (Sphaeria) FSS no. 191, sp. nov.: Fr 2: 554

- rubra (Auricularia papyrina var.) M: 35 ← [BH: 280]
 rubro castaneus (Agaricus subdulcis var.) M: 54+ ← [DC 2: 144+]
 rubro-cinctus (Hypochnus) Spr: 310 ← [Ehor: 84 "rubrocinctus"]
 rubrocinerus (Hypochnus) LD 22: 368 ← [Ehor: 84 "rubrocinctus"]
 rubromarginatus (Agaricus) Fr: 150 ("rubro-marginatus" of index) ← [FO 1: 42]
 rubrotintus (Hypochnus) Ehren: 519 ← [Ehor: 84 "rubrocinctus"]
 rubrum (Polystigma) SA: 516, M: 151 ← [DC 6: 164+]
 rubrum (Xyloma) N&B: 301, H: 9, Schl: 61, P: 316 ← [POM 2: 101]
 rufa (Clavaria) Fr: 480 ← [PS: 600] ← "Müller," FD 5: pl. 775 + text+]
 rufescens (Dentinum) G: 650 ← [Sch 4: 95 (Hydnum)]
 rufescens (Hydnum) Fr: 401, not 400, LD 22: 94 ← [PS: 555] ← Sch 4: 95]
 rufescens (Polyporus) Fr: 351, not 315 ← [PS: 550 (Sistotrema)]
 rufescens (Agaricus fistulosa var.) M: 63, var. nov.
 rufescens (Agaricus grammopodius var.) M: 71, var. nov.
 rufida (Clavaria pistillaris var.) M: 30 ← [BH: 211, pl. 244]
 rufipes (Agaricus gnaphaliocephalus var.) M: 69, var. nov.
 rufo-fusca (Sphaeria) Schl: 59 ← [Fr[ies?]]
 rufo-lamellatus (Agaricus cyathiformis var.) M: 67, var. nov.
 rufo-olivaceus (Agaricus) Fr: 223 ← [PS: 285]
 rufo velutinus (Agaricus) M: 50+ ← [DC 2: 134 "rufo-velutinus"]
 rufum (Leccinum aurantiacum [var.]) G: 646, var. nov.?
 rufus (Agaricus lactifluus) Z: 317+ ← [PS: 433+ (Agaricus lactifluus subdulcis var.)]
 rufus (Boletus) K: 27 ← [Sch 4: 75]
 rufus (Boletus aurantiacus var.) M: 46 ← [Sch 4: 75 (Boletus)]
 rufus (Merulius) Fr: 327 ← [PS: 498]
 rufus (Mucor) N&B: 357 ← [PS: 200]
 rufus (Polyporus) Fr: 379 ← [Schr: 172 (Boletus) ← Schrader apud GSN: 1435 (Boletus)]
 rugosa (Clavaria) Fr: 473, M: 31, SA: 539 ← [BH: 206, pl. 448, fig. 2]
 rugosa (Gemmularia) LD 18: 311 ← [Rafinesque-Schmalz, "J. Phys. Aug. 1810"]
 rugosa (Ramaria) G: 655 ← [BH: 206, pl. 448, fig. 2 (Clavaria)]
 rugosa (Sphaeria) P: 289 ← [Bolt: 123, pl. 123, fig. 2]
 rugosa (Thelephora) Fr: 439 ← [PD: 30 (Stereum)]
 rugosus (Boletus) P: 254 ← [S: p.f.p. 134+ ← With: 321]
 rugulosa (Sphaeria) Schl: 59 ← [PS: 65 (Sphaeria pomiformis var.)]
 rupestre (Dematium) G: 558, Schl: 57 ← [PD: 43 (Racodium)]

- rupestris (Byssus) SA: 526, M: 12 ← [DC 2: 592]
 rupestris (Sphaeria) G: 528 ← [S: p.f.p. 371, fig. 2]
 rupinicola (Tremella) Schl: 60, sp. nov. ← [Scop: 435]
 russula (Agaricus) Fr: 38 ← [Scop: 435]
 russulus (Gymnopus) G: 607 ← [Scop: 435 (Agaricus)]
 rutila (Cortinaria) G: 629 ← [Sch 4: 24 (Agaricus)]
 rutilans (Agaricus) Fr: 41 ← [Sch 4: 51]
 rutilans (Agaricus gymnopus) Z: 94+ ← [Sch 4: 51 (Agaricus)]
 rutilans (Gymnopus) G: 605 ← [Sch 4: 51 (Agaricus)]
 rutilis (Agaricus) Fr: 315 (As "A. Gomph[idi]us") ← [Sch 4: 24 "rutilus"]
 rutilus (Agaricus) H: 20, P: 400 ← [Sch 4: 24]
- S --
- sabinae (Tremella) LD 20: 140, H: 32, P: 510 ← [Dick 1: 14 (as alga)]
 sacchari (Hydnum) Fr: 416 ("sachari" of index) ← [Sprengel, "Vetensk. Akad. Handl. 1820: 51"]
 sagatus (Agaricus) Fr: 282, nom. nov.
 saginus (Agaricus) Fr: 226, sp. nov.
 sajor caju (Agaricus) Fr: 175+, nom. nov.
 salicella (Sphaeria) FSS no. 188, sp. nov.: Fr 2: 377.
 salicina (Thelephora) Fr: 442, sp. nov.
 salicina (Thelephora) Schl: 60, sp. nov.
 salicina (Tremella) Schl: 60, sp. nov.
 salicinum (Astoma) G: 525 ← [S: p.f.p. 372, fig. 1 (Sphaeria)]
 salicinum (Rhytisma) FSS no. 208, sp. nov.: Fr 2: 568.
 salicinum (Sclerotium) SA: 618, M: 130 ← [DC 6: 114] ← "Persoon, in Mougeot & Nestler Exs. no. 386"]
 salicinum (Xyloma) G: 545, P: 318, Schl: 61, H: 9, Spr: 279+ ← [PD: 5]
 salicinus (Agaricus) Fr: 202 ← [PIC: 9]
 salicinus (Boletus) Re: 51, H: 27, N&B: 338, M: 42 ← [BH: 340, pl. 433, fig. 1]
 salicinus (Daedalea) P: 247 ← [BH: 340, pl. 433, fig. 1 (Boletus)]
 salicinus (Polyporus) Fr: 376 ← [Persoon apud GSN: 1437 (Boletus)]
 salicis (Erysiphe) Schl: 57 ← [DC 2: 273]

- saligna* (Daedalea) Fr: 337 ← [FO 2: 241]
salignum (Xyloma) M: 150 ← [PS: 106] ← Ehrhardt, Pl. Crypto. Exs. Dec. 30, no. 299]
salignus (Agaricus) Fr: 183 ← [PS: 478]
sambuci (Peripherostoma) G: 515 ← [PS: 14 (Sphaeria)]
sambuci (Sphaeria) Re: 54, M: 140, Schl: 59 ← [PS: 14]
sambucinus (Agaricus) Fr: 257 ← ["FO 1: 8" (not found)]
sanguinea (Cortinaria) G: 629 ← [S: p.f.p. 43] ← WJ 2: 107 (Agaricus)]
sanguinea (Peziza) M: 20, Schl: 58, G: 665 ← [PD: 34]
sanguinea (Sphaeria) G: 526, LD 22: 386, Schl: 59, M: 145, P: 279 ← [Bolt: 121, pl. 121, fig. 1] Fr 2: 453
sanguinea (Typhoderma) G: 559 ← [Dillw[yn] (Conferva)]
sanguineus (Agaricus) Fr: 229 ← [WJ 2: 107]
sanguineus (Agaricus) SA: 562, M: 53 ← [BH: pl. 42 + index†]
sanguineus (Agaricus muscarius var.) P: 203, var. nov.
sanguineus (Boletus) P: 439, SA: 549 ← [LSpPl: 1646]
sanguineus (Polyporus) Fr: 371 ← [LSpPl: 1646 (Boletus)]
sanguinolenta (Thelephora) Fr: 440 ← [A&S: 274]
sanguinolentus (Agaricus) Fr: 149, not 145 ← [A&S: 196]
sanguinolentus (Polyporus) Fr: 383 ← [A&S: 257 (Boletus poria ____)]
sanguisorbe (Erysiphe) M: 134 ← [DC 6: 108]
sanius (Agaricus) Fr: 232, sp. nov.
sapineus (Agaricus) Fr: 239, nom. nov.
sarcoides (Fistulina) SA: 547, sp. nov.
sarcoides (Octospora) G: 667 ← [With: 82 (Tremella) ← Dick 1: 21 (Helvella)]
sarcoides (Tremella) H: 32, P: 511 ← [With: 82 (Tremella) Dick 1: 21 (Helvella)]
sarmentosa (Tubercularia) Schl: 60 ← [Fr[ies?]]
saturninus (Agaricus) Fr: 219, sp. nov.
scabellus (Agaricus) Fr: 259 ← [A&S: 189]
scaber (Agaricus) Fr: 255, P: 205 ← [S: p.f.p. 207] ← Müller, FD 14: pl. 832 + text]
scaber (Boletus) Fr: 393, nom. nov.
scaber (Boletus) N&B: 334, K: 28, Re: 52, SA: 555, M: 46, P: 242 ← [BH: 319, pls. 132, 489, fig. 1]
scabiosaecola (Sphaeria lichenoides var.) M: 136, var. nov.
scabra (Cortinaria) G: 630 ← [Müller, FD 14: pl. 832 + text (Agaricus)]

- scabrosa (Sphaeria) LD 22: 386, M: 140, SA: 521 ← [DC 6: 288 ← [BH: 180, pl. 468, fig. 5 (Hypoxylon)]
- scabrosum (Hypoxylon) Re: 46 ← [BH: 180, pl. 468, fig. 5]
- scabrum (Leccinum) G: 647 ← [BH: 319, pls. 132, 489, fig. 1 (Boletus)]
- scandicis (Erysiphe) M: 133 ← [DC 6: 137]
- scaurus (Agaricus) Fr: 223+ ← [FO 2: 75]
- schumacheri (Agaricus) Fr: 87 ← [FO 2: 109]
- schweinitzii (Polyporus) Fr: 351, nom. nov.
- sciophanus (Agaricus) Fr: 102, sp. nov.
- scirpi (Hysterium) FSS no. 170 ← ["Funk"] Fr 2: 590
- scirpicola (Sphaeria) FSS no. 150 ← [DC 2: 300]
- scirpinum (Hypoderma) M: 152, LD 22: 370 ← [Persoon apud DC 6: 166]
- scirpinum (Leptostroma) FSS no. 175, sp. nov.: Fr 2: 598
- sclerotoides (Pistillaria) Fr: 497, not 297 ← [DC 6: 29 (Clavaria)]
- scoria (Sphaeria) M: 139 ← [DC 2: 286]
- scorodonius (Agaricus) Fr: 130 ← [FO 1: 29]
- scrobiculatus (Agaricus) Fr: 62 ← [Scop: 450]
- scutellata (Periza) N&B: 349, M: 21, G: 665, SA: 531, L: 467, H: 33, P: 263 ← [LSP: 1181]
- scutellatum (Engizostoma) G: 520 ← [PS: 37 (Sphaeria)]
- scutellatum (Sclerotium) G: 591 ← [A&S: 74]
- scutellatus (Agaricus) Fr: 211, sp. nov.
- scyphoides (Agaricus) Fr: 163, nom. nov.
- sector (Boletus) Spr: 310 ← [Ehor: 86]
- sector (Polyporus) Fr: 505 ← [Ehor: 86 (Boletus)]
- sedi (Ectostroma) FSS no. 177, sp. nov.: Fr 2: 602
- segestrius (Agaricus) Fr: 262 ← [FO 2: 27]
- sejunctus (Agaricus) Fr: 47 ← [S: p.f.p. 126]
- semen (Sclerotium) M: 130 ← [TW 1: 4]
- semiglobatus (Agaricus) Fr: 384+, H: 23 ← [BEFC 1: 141 "semi-globatus"]
- semiglobatus (Agaricus) Fr: 237+ ("semiglobosus" of index) ← [A&S: 169 "subglobosus"]
- semiglobatus (Coprinus) G: 632 ← [BEFC 1: 141 [Agaricus "semi-globatus"]]
- semilibra (Morchella) M: 90 ← [DC 2: 212]
- seminiforme (Sclerotium) G: 591 ← [TW 1: 4 "semen"]
- semiorbicularis (Agaricus) N&B: 324 ← [BH: 467, pl. 422, fig. 1]
- semi-orbicularis (Agaricus) SA: 569 ← [BH: 467, pl. 422, fig. 1 "semiorbicularis"]
- semi-orbicularis (Agaricus) M: 59+ ← [BH: 467, pl. 422, fig. 1 "semiorbicularis"]
- semiovatus (Agaricus) Fr: 300, H: 24, P: 223 ← [WBA: 394]

- semiovatus (*Agaricus coprinus*) Z: 109+ ← [WBA: 394 (*Agaricus*)]
 semiovatus (*Coprinus*) G: 632 ← [WBA: 394 (*Agaricus*)]
 semitalis (*Agaricus*) Fr: 117, sp. nov.
 septiaria (*Daedalea*) Fr: 333 ← [JColl 1: 339 (*Agaricus*)]
 septentrionale (*Hydnum*) Fr: 414, sp. nov.
 serens (*Hypochnus*) LD 22: 368 ← [FO 2: 278 ← PS: 580 (*Thelephora* "sera")]
 serialis (*Polyporus*) Fr: 370, sp. nov.
 serialis (*Thelephora*) Fr: 445, sp. nov.
 seriatum (*Phacidium*) FSS no. 161, sp. nov.: Fr 2: 185
 sericellus (*Agaricus*) Fr: 196 ← [FO 2: 145 "sericeus" ← PS: 366 "sericeus"
 BH: 576 "sericeus"]
 sericeus (*Agaricus*) M: 78 ← [BH: 576, pl. 526, 413, fig. 2]
 sericeus (*Agaricus sericeus* var.) M: 78 ← [BH: 576 (*Agaricus* _____)]
 serifluus (*Agaricus*) Fr: 75 ← [DO 6: 45]
 serotinus (*Agaricus*) Fr: 187 ← [PS: 479]
 serpens (*Daedalea*) Fr: 340 ← [FO 2: 265 (*Polyporus*)]
 serpens (*Merulius*) Fr: 327 ← [PS: 497 ← Tode, "Abh. Hall. Nat. Gesell. 1: 355"]
 serpens (*Nemania*) G: 516 ← [PS: 20 (*Sphaeria*)]
 serpens (*Sphaeria*) M: 141 ← [POM 1: 18]
 serrulatus (*Agaricus*) Fr: 204 ← [PS: 463 "serrula"]
 sessilis (*Agaricus variabilis* var.) M: 51 ← [BH: 383 (*Agaricus* _____)]
 sessilis (*Dasyscyphus*) G: 671 ← [S: p.f.p. 389 (*Peziza*)]
 sessilis (*Peziza*) P: 466 ← [S: p.f.p. 389]
 setiformis (*Rhizomorpha*) M: 136, Ehren: 519, LD 22: 385 ← [Roth 1: 235]
 setipes (*Agaricus*) Fr: 159 ← [FO 2: 162]
 setosa (*Clavaria*) N&B: 345, sp. nov.
 setosus (*Rhizomorpha setiformis* var. *Lichen* _____) M: 136+
 sideroides (*Agaricus*) M: 62 ← [BH: 574, pl. 588]
 simplex (*Helmisporium*) LD 20: 496 ← ["Kunze"]
 sinensis (*Polyporus*) Fr: 345 (as "P. Fav[olus] _____"), nom. nov.
 sinopicus (*Agaricus*) Fr: 83 ← [FO 2: 197 "hinopicus"]
 sinuatus (*Agaricus*) Fr: 197+, M: 74 ← [BH: pl. 579, fig. 1+]
 sinuosa (*Daedalea*) G: 638 ← [S: p.f.p. 194 (*Boletus*)]
 sinuosus (*Cantharellus*) Fr: 319, nom. nov.
 sinuosus (*Polyporus*) Fr: 381, sp. nov.

- siphiarius (Agaricus) Fr: 261, sp. nov.
 sistotrema (Boletus) Fr: 389 ← [FO 1: 120+ "sistotremoides"]
 sistratus (Agaricus) Fr: 24, sp. nov.
 socialis (Agaricus) Fr: 251 ← [DC 6: 48]
 solani (Xyloma) Schl: 61, sp. nov.
 solenia (Peziza) M: 22 ← [PS: 676]
 solida (Clavaria) G: 656, sp. nov.
 solida (Sphaeria) P: 493 ← [S: p.f.p. 314]
 solidum (Astroma) G: 524 ← [S: p.f.p. 314 (Sphaeria)]
 solitaria (Sphaeria) G: 527 ← [S: p.f.p. 357, fig. 2]
 solitarius (Agaricus) Fr: 17, SA: 587, M: 87, N&B: 307, L: 475, R: 50 [BH: 675, pls.
 48, 593]
 soloniensis (Polyporus) Fr: 365 ← [DC 6: 41 (Boletus) ← Duby, "Fl. Orl., 177"
 (Agaricus)]
 sonchi (Erysiphe) Schl: 57, sp. nov.
 sordarius (Agaricus gymnopus) Z: 96+ ← [PS: 370 (Agaricus ____)]
 sordidus (Agaricus) Fr: 51 ← [Sae: 341]
 sordidus (Agaricus) P: 196 ← [Dick 1: 16]
 sowerbii (Erysibe) G: 590, sp. nov.
 sowerbii (Macroscyphus) G: 671 ← [PS: 642 (Peziza "sowerbea")]
 spadicea (Daedalea) Fr: 505 ← [PID: 34 (Hydnum)]
 spadicea (Helvella) LD 20: 512 ← [Sch 4: 112 (Elvela)]
 spadicea (Vaginata) G: 601 ← [PD: 66 (Amanita)]
 spadicea (Thelephora) Fr: 438 ← [PS: 568]
 spadiceo-griseus (Agaricus) N&B: 324 ← [Sch 4: 59 "spadiceogriseus"]
 spadiceus (Agaricus appendiculatus var.) M: 60 ← [Sch 4: 59 (Agaricus "spadiceogriseus")]
 sparteus (Agaricus) Fr: 266, sp. nov.
 spathulatum (Hydnum) Fr: 423 ← [Schr: 178 "spatulatum"]
 spathulatum (Xylaria polymorpha [var.]) G: 513, var. nov.
 spathulatus (Agaricus) P: 430 ← [PS: 479]
 spathulatus (Agaricus petaloides var.) M: 51 ← [PS: 479 (Agaricus ____)]
 spatulata (Helvella) P: 452 ← [Dick 1: 21 (Clavaria)]
 speciosus (Agaricus) Fr: 278 ← [FO 2: 1 (Amanita)]
 speciosus (Agaricus) HFD 13: t. 1737 ← [Fr: 278]
 speirea (Sphaeria) FSS no. 206, sp. nov.: Fr 2: 261

- speireus (Agaricus) Fr: 159 ← [FO 1: 90]
 spermoides (Sphaeria) Schl: 59, P: 282, H: 7, SA: 523 ← [PS: 75]
 sphaeraie (Sclerococcum) FSS no. 179, sp. nov.: Fr 3: 257
 sphaeroides (Hysterium) FSS no. 168 ← [A&S 57] Fr 2: 588
 sphaerosperma (Stilbospora) G: 545, M: 147 ← [POM 1: 31]
 sphaleromorphus (Agaricus) M: 60 ← [BH: 629, pl. 540, fig. 2]
 sphincteria (Sphaeria) SA: 523, LD 22: 386, M: 145 ← [BH: 168, pl. 444, fig. 1]
 sphinctericum (Hypoxylon) Re: 46 ← [BH: 168, pl. 444, fig. 1]
 sphalacnoides (Agaricus) Fr: 137 ← [Hornemann, FD 28: pl. 1678 + text]
 spiculifera (Sphaeria) P: 494 ← ["Furton, Midl. Fl. no. 1106"]
 spiculosa (Gyrraria) G: 594 ← [POM 2: 99 (Tremella)]
 spiculosa (Tremella) Schl: 60 ← [POM 2: 99]
 spilomeus (Agaricus) Fr: 220 ← [FO 2: 83]
 spinosa (Sphaeria) Schl: 59, M: 139 ← [PD: 3]
 spinulosa (Clavaria) Fr: 468 ← [POM 2: 59]
 spinulosa (Himantia) LD 21: 165 ← [FO 2: 285]
 splendens (Agaricus) Fr: 84 ← [PS: 452]
 spodiocleus (Agaricus) Fr: 182 ← [FO 1: 93]
 spongiosa (Poria) G: 640 ← [PS: 543 (Boletus)]
 spongiosus (Boletus) H: 27 ← [PS: 543]
 spongiosus (Polyporus) Fr: 377 ← [PS: 543] ← "Bolton"
 spumeus (Agaricus) Fr: 252, nom. nov.
 spumeus (Polyporus) Fr: 358 ← [S: p.f.p. 211 (Boletus)]
 squalinum (Hydnum) Fr: 420, sp. nov.
 squamosum (Hydnum) LD 22: 92 ← [BH: 310, pl. 409 "squamosum"]
 squamosum (Hydnum) Re: 50, N&B: 341 ← [BH: 310, pl. 409]
 squamosus (Agaricus) Fr: 284 ← [PS: 409]
 squamosus (Agaricus) M: 84 ← [BH: 625, pl. 266 "squamosus"]
 squamosus (Agaricus) P: 404, SA: 584 ← [BH: 625, pl. 266]
 squamosus (Boletus) P: 441, H: 27 ← [Bolt: 77, pl. 77] ← "HFA: 626"
 squamosus (Polyporus) Fr: 343 (as "P. Fav[olus] _____") ← [Bolt: 77, pl. 77]
 "HFA: 626" (Boletus)]
 squamula (Merulius) H: 25 ← [BEFC 1: 95 (Agaricus)]
 squamulosus (Agaricus) Fr: 82 ← [PS: 449]
 squarrosa (Lepiota) G: 602 ← [Willd: 380] ← BEF: 85]

- squarrosus (Agaricus) Fr: 243 ← [PS: 268 ← Müller (polynomial) +]
 squarrosus (Agaricus) M: 64 ← [BH: 463, pl. 535, fig. 3]
 stabularis (Thelephora) Fr: 435, sp. nov.
 stagninus (Agaricus) Fr: 268, sp. nov.
 stalactiticus (Boletus (Apor) fomentarius var.) MNA: 238, var. nov.
 stellare (Xyloma) Schl: 61 ← [POM 2: 100]
 stellatus (Agaricus) Fr: 163 ← [FO 1: 85]
 stellatus (Fibrillaria) LD 21: 165 ← [S: p.f.p. 387]
 stellulata (Sphaeria) LD 22: 401 ← [Ach[arius?]]
 stercoraria (Peziza) P: 460, M: 22, SA: 532 ← [BH: 256, pl. 376, fig. 1, pl. 438, fig. 4]
 stercoraria (Sphaeria) G: 527 ← [S: p.f.p. 357, fig. 1]
 stercorarium (Sclerotium) FBR: 45 ← [DC 2: 277 "stercorarium"]
 stercorarium (Sclerotium) M: 130, SA: 617 ← [DC 2: 277]
 stercorarius (Agaricus) Fr: 291, P: 234, H: 23 ← [Scop: 427]
 stercorarius (Agaricus) M: 57, L: 473, SA: 567, N&B: 320 [BH: 398, pl. 68]
 stercorea (Hydrophora) LD 22: 261 ← [TW 2: 6]
 stercorea (Peziza) Schl: 58, G: 665 ← [GSN: 1457 ← WH: 106]
 stereoides (Polyporus) Fr: 369 ← [FO 2: 258]
 sterilis (Thelephora) Fr: 454, sp. nov.
 sterquilinus (Agaricus) Fr: 308 (as "A. COPR."), nom. nov.
 stigma (Nemania) G: 517 ← [HV 1: 7 (Sphaeria)]
 stigma (Sphaeria) LD 22: 386, H: 5, Schl: 59, M: 141, SA: 522 ← [HV 1: 7]
 stilostoma (Sphaeria) FSS no. 145, sp. nov.: Fr 2: 403
 stipata (Sphaeria) FSS no. 199, sp. nov.: Fr 2: 558
 stipatum (Hydnum) Fr: 425, sp. nov.
 stipatus (Agaricus) Fr: 2964 ← [PS: 423]
 stipatus (Agaricus pratella) Z: 3124 ← [PS: 423 (Agaricus —)]
 stipitarius (Agaricus) Fr: 137, sp. nov.
 stipitata (Helvella) P: 258 ← [With: 346]
 stipitata (Peziza) M: 24 ← [BH: 271, pl. 196, 457, fig. 2]
 stipitata (Tremella) LD 22: 305 ← ["Bosc"]
 stipitidis (Agaricus) H: 20, P: 402 ← [With: 191]
 stipticus (Agaricus) Fr: 188 ← [BH: 389, pls. 140, 557, fig. 1 "stypiticus"]
 stipticus (Polyporus) Fr: 359 ← [PS: 525 (Boletus)]
 stipularis (Agaricus) Fr: 160, sp. nov.

- stramineus (Agaricus muscarius var.) P: 203 ← [Scop: 418 (Agaricus)]
- striaeforme (Hypoderma) M: 153 ← [PS: 32 (Sphaeria)]
- striaeformis (Sphaeria) FSS no. 195, sp. nov.: Fr 2: 428
- striaeformis (Sphaeria) H: 6 ← [PS: 32]
- striata (Daedalea) Fr: 334 ← [SIN: 1920 (Boletus)]
- striatulus (Agaricus) Fr: 193 ← [PS: 485]
- striatus (Agaricus) Fr: 302, SA: 569, L: 473, M: 58 ← [BH: 433, pl. 552, fig. 2]
- striatus (Coprinus dessemminatus var.) G: 635 ← [BH: 433, pl. 552, fig. 2 (Agaricus —)]
- stricta (Clavaria) Fr: 468, K: 32 ← [PS: 45]
- stricta (Sphaeria) FSS: no. 148 ← [PS: 59] Fr 2: 474
- strictum (Hysterium) LD 22: 401 ← [FO 1: 194 "stricticum"]
- strigiceps (Agaricus) Fr: 270, sp. nov.
- strigosum (Dematium) H: 34 ← [PS: 695 ← PD: 75]
- strigosum (Hydnum) Fr: 414 ← [Swartz, "Vetensk. Akad. Handl. 1810: 250"]
- strobilina (Mycena) G: 621 ← [PS: 393 (Agaricus)]
- strobilina (Sphaeria) H: 8 ← [Mougeot & Nestler, Exs. no. 572]
- strobilinus (Agaricus) Fr: 150 ← [PS: 393]
- strobulina (Sphaeria) Schl: 59 ← ["Rafinesque-Schmalz"]
- stuposum (Sporotrichum) G: 551 ← [LM 3: 12]
- stylifera (Sphaeria) G: 530, sp. nov.
- stylobates (Agaricus) Fr: 153⁺, M: 61 ← [PS: 390]
- stypticus (Agaricus) N&B: 331, SA: 560, R: 25, M: 51 ← [BH: 389, pls. 140, 557, fig. 1 (Agaricus)]
- stypticus (Crepidopus) G: 616 ← [BH: 389, pls. 140, 557, fig. 1 (Agaricus)]
- svaveolens (Agaricus) Fr: 91 ("svaveolens" of index) ← [Sae: 337]
- svaveolens (Boletus) R: 19, P: 443, SA: 551, G: 641, M: 42 ← [LSP: 1177]
- svaveolens (Daedalea) Fr: 337 ("svaveolens" of index) ← [BH: 342 (Boletus)]
- svaveolens (Daedalea) G: 639, P: 247 ← [LSP: 1177 (Boletus)]
- svaveolens (Hydnum) Fr: 402 ("svaveolens" of index) ← [Scop: 472]
- svaveolens (Hydnum) LD 22: 95 ← [Scop: 472]
- svaveolens (Polyporus) Fr: 366 ("svaveolens" of index) ← [LSP: 1177 (Boletus)]
- subalutaceus (Agaricus) Fr: 90 ← [BEFC 2: 27]
- subcaerulea (Auricularia tremelloides var.) M: 34 ← [BH: 278]
- subcantharellus (Agaricus) P: 183 ← [S: p.f.p. 413]
- subcarnaceum (Hydnum) Fr: 418 ← [FO 2: 271]
- subcavus (Agaricus) Fr: 28 ← [Sae: 262]

- subconfluens (Sphaeria) P: 284 ← [S: p.f.p. 370, fig. 7]
 subcorticale (Exormatostoma) G: 523 ← [S: p.f.p. 296 (Sphaeria)]
 subcorticalis (Rhizomorpha) P: 305, N&B: 370 ← [PS: 704]
 subcorticalis (Sphaeria) P: 285 ← [S: p.f.p. 296]
 subdulcis (Agaricus) Fr: 70, M: 54, N&B: 325, R: 31 ← [PS: 433+ "subdulcis" BH:
 pl. 224+ "lactifluus dulcis"]
 subdulcis (Lactarius) G: 625 ← [PS: 433+ (Agaricus) ← BH: pl. 224+ "lactifluus
 dulcis"]
 suberosus (Boletus) M: 41, Re: 51, SA: 549, P: 252, H: 27 ← [BH: 354, pl. 482 ← LSP:
 1176]
 suberosus (Polyporus) Fr: 505 ← [WUPS: 457 (Boletus) ← LSP: 1176 (Boletus)]
 subfarinaceus (Agaricus farinaceus var.) P: 214, var. nov.
 subferrugineus (Agaricus) Fr: 234, not. 237 ← [FO 2: 62 ← BEFC 2: 7]
 subimmersum (Exormatostoma) G: 523 ← [S: p.f.p. 372, fig. 8 (Sphaeria)]
 sublamellosum (Hydnum) Re: 50, SA: 546 ← [BH: 306, pl. 453, fig. 1]
 sublanatus (Agaricus) Fr: 214 ← [S: p.f.p. 224+]
 subliquescens (Agaricus) Fr: 304 ← ["Bull" (of index) ← Sae: 358]
 subliquescent (Agaricus) HFD 12, t. 1732, fig. 2 ← [Fr: 304 ← Sae: 358]
 subradians (Sphaeria) FSS no. 204, sp. nov.: Fr 2: 525
 subreflexus (Agaricus) Fr: 271 ← [Otto, "Ag., 77"]
 subspadiceus (Polyporus) Fr: 378 ← [FO 2: 263]
 subsquamosus (Hydnum) Fr: 399 ← [BEF: 111]
 subsquamosus (Polyporus) Fr: 346 ← [LSP: 1178 (Boletus)]
 subtile (Helotium) LD 20: 509 ← [FO 2: 310]
 subtile (Sphaeronaema) FSS no. 160, sp. nov.: Fr 2: 539
 subtilis (Agaricus) Fr: 302, sp. nov.
 subtilis (Clavaria) Fr: 475 ← [PCC: 51]
 subtilis (Polyporus) Fr: 506 (as "P. P[rothelium]") ← [Schr: 173 (Boletus)]
 subtomentosum (Leccinum) G: 647 ← [LSP: 1178 (Boletus)]
 subtomentosus (Boletus) Fr: 389, K: 29 ← [LSP: 1178]
 subtomentosus (Boletus) P: 240 ← [LSP: 1178 "subtomentosus"]
 subtortus (Agaricus) Fr: 222 ← [PS: 284]
 subulularis (Peziza) M: 23 ← [BH: 236, pl. 500, fig. 2] Fr 2: 118
 subulata (Sphaeria) Spr: 279+ ← [PS: 94 (Sphaeria)]
 subulatum (Asteroma) G: 523 ← [PS: 94 (Sphaeria)]

- subulatum (Helmisporium) LD 20: 496 ← [Nees, "Nova Acta Cur. 9: pl. 5"]
 suecica (Clavaria) Fr: 469 ← [FO 1: 156]
 suffrutescens (Agaricus) Fr: 177 ← [Brot: 466]
 suffulata (Erysibe) G: 589 ← [Rebentisch, "Fl. Neomont."]
 suffultum (Erysiphe) Schl: 57 ← [Rebentisch, "Fl. Neomont."]
 sulcata (Sphaeria) P: 492 ← [Bolt: 124, pl. 124]
 sulfureus (Boletus) M: 42 ← [BH: 347, pl. 429 "sulphureus"]
 sulphurea (Himantia) LD 21: 163 ← [POM 1: 38 (Corticium)]
 sulphurea (Peziza) G: 665 ← [PD: 33]
 sulphurea (Thelephora) Fr: 452 (as "T. H[imantia] _____") ← [PS: 703 (Himantia) ← — POM
 1: 38 (Corticium)]
 sulphureus (Agaricus) Fr: 110, L: 474, P: 399, M: 74 ← [BH: 563, pl. 168, 545, fig. 2]
 sulphureus (Agaricus gymnopus) Z: 94+ ← [BH: 563, pls. 168, 545, fig. 2 (Agaricus _____)]
 sulphureus (Boletus) HPL: pl. 132 + text, H: 28, P: 446 ← [BH: 347, pl. 429]
 sulphureus (Gymnopus) G: 606 ← [BH: 563, pls. 168, 545, fig. 2 (Agaricus)]
 sulphureus (Polyporus) Fr: 357 ← [BH: 347, pl. 429 (Boletus)]
 supinus (Agaricus) Fr: 142, nom. nov.
 supinus (Polyporus) Fr: 376 ← [SIN: 1926 (Boletus)]

- tabacina (Auricularia) P: 260 [S: p.f.p. 25]
 tabacina (Thelephora) Fr: 437 [S: p.f.p. 25 (Auricularia)]
 tarda (Omphalia) G: 614 [PS: 461]
 tardus (Agaricus omphalia) Z: 350+ [PS: 461 (Agaricus _____)]
 tecta (Sphaeria herbarum var.) Schl: 59 [POM 2: 69 (Sphaeria complanata var. _____)]
 tecta (Sphaeria herbarum [var.]) H: 7 [POM 2: 69 (Sphaeria complanata var.)]
 tegularis (Agaricus) Fr: 294 [Sae: 317]
 temulentus (Agaricus) Fr: 268, sp. nov.
 tenacella (Clavaria) Fr: 472 [PAH: 179]
 tenacellus (Agaricus) Fr: 131 [PRNB: 104]
 tenax (Agaricus) Fr: 290 [FO 1: 54]
 tenella (Hydrophora) LD 22: 261 [TM 2: 6]
 tenellus (Cantharellus) Fr: 325 [DC 2: 132 (Merullius)]
 tenellus (Hymenoscyphus) G: 674 [BEFC 1: 215 (Peziza)]
 tenellus (Merullius) M: 49 [DC 2: 132]
 tener (Agaricus) Fr: 265, H: 22, P: 220 [Sch 4: 31, pl. 70]
 tener (Agaricus mycena) Z: 104+ [Sch: 4: 31, pl. 70 (Agaricus _____)]
 tenera (Mycena) G: 620 [Sch 4: 31, pl. 70 (Agaricus "tener")]
 tentaculis (Agaricus) M: 65 [BH: 446, pl. 560, fig. 3]
 tenuicaulis (Polyporus) Fr: 344 [POW: 12]
 tenuis (Agaricus varius var.) P: 217 [S: p.f.p. 385, fig. 5 (Agaricus _____)]
 tenuis (Clavaria) Schl: 56, sp. nov.
 tenuis (Typhula) Fr: 495 [S: p.f.p. 386, fig. 5 (Clavaria)]
 tenuissimum (Helmisporium) LD 20: 496 [Kunze"]
 tephroleucus (Agaricus) Fr: 34 [PS: 351]
 tephroleucus (Polyporus) Fr: 360, sp. nov.
 teres (Clavaria tomentosa var.) M: 33, var. nov.
 teres (Rhizomorpha fragilis var.) M: 136, var. nov.
 terginus (Agaricus) Fr: 128, sp. nov.
 tergiversans (Agaricus) Fr: 303, sp. nov.
 terrestre (Stachylidium) G: 553 [LM 3: 15]
 terrestris (Polyporus) Fr: 383 [PIP 3: 35]
 terrestris (Stictus) G: 664, sp. nov.

- terrestris* (*Thelebolus*) G: 531 ← [A&S: 71]
terrestris (*Thelephora*) Fr: 431 ← [PS: 566 ← "Ehrhardt, Pl. Crypto. Exs. Dec. 18, no. 178"]
terreus (*Agaricus*) P: 402 ← [Sch 4: 28, pl. 64]
tesellatum (*Exormatostoma*) G: 522 ← [PS: 48 (*Sphaeria* "tesella")]
tessella (*Sphaeria*) FSS no. 187 ← [PS: 48] Fr 2: 393
tesselatus (*Agaricus*) M: 52 ← [BH: 583, pl. 513, fig. 1]
tessulatus (*Agaricus*) Fr: 186 ← [BH: 583, pl. 513, fig. 1, "tesselatus"]
tessulatus (*Polyporus*) Fr: 342 ← [FO 2: 254]
testaceus (*Agaricus*) R: 30 ← ["Persoon"]
theiogalus (*Agaricus*) M: 53, R: 29, SA: 563 ← [BH: 495, pl. 567, fig. 2]
theiogalus (*Lactarius*) G: 624 ← [BH: 495, pl. 567, fig. 2 (*Agaricus*)]
thejagalus (*Agaricus*) Fr: 71 ← [BH: 495, pl. 567, fig. 2 "theiogalus"]
thelephorus (*Agaricus*) Fr: 252 ← [PS: 307, "telephorus"]
thyrcopus (*Agaricus* butyraceus var.) M: 73 ← [PS: 308 (*Agaricus* "thrichopus")]
thunbergii (*Daedalea*) Fr: 335, nom. nov.
tigrina (*Omphalia*) G: 613 ← [S: p.f.p. 68 (*Agaricus*)]
tigrinus (*Agaricus*) Fr: 176, N&B: 329, M: 67, R: 35 ← [S: p.f.p. 68]
tillaceum (*Erineum*) G: 555, N&B: 369, M: 17, P: 314 ← [POM 1: 25]
tilliae (*Erineum*) Schl: 57 ← [POM 1: 25, "tillaceum"]
tilliae (*Exormatostoma*) G: 522 ← [PD: 3 (*Sphaeria*)]
tilliae (*Exosporium*) FSS no. 178 ← [LM 3: 10] Fr 3: 361
tilliae (*Sphaeria*) M: 145 ← [PD: 3]
tiphynum (*Polystigma*) M: 151 ← [DCM 3: 338]
titthymalinus (*Agaricus*) Fr: 71 ← [Scop: 452]
titubans (*Agaricus*) M: 58, P: 227 ← [S: p.f.p. 128]
titubans (*Prunulus*) G: 632 ← [S: p.f.p. 128 (*Agaricus*)]
todei (*Typhula*) Fr: 494 ← [FO 2: 298 (*Typhula*) ← FO 1: 160 (*Mitrlula*)]
tofielidae (*Astoma*) G: 525 ← [S: p.f.p. 370, fig. 3]
togularis (*Agaricus*) Fr: 241, N&B: 309 ← [BH: 639, pl. 595, fig. 2]
tomentosa (*Clavaria*) M: 33 ← [LEM 2: 38]
tomentosa (*Conferva*) Fodere: 249 ← [no author given]
tomentosa (*Sphaeria*) P: 287 ← [WSA: 383]
tomentosum (*Hydnum*) Fr: 405 ← [LSP: 1178]
tomentosum (*Stilbum*) M: 18 ← [Schrader, J. Bot. 2: 65] Fr 3: 301

- tomentosus (Agaricus) M: 56, SA: 566 ← [BH: 402, pl. 138]
 tomentosus (Agaricus congregatus var.) P: 235 ← [BH: 402, pl. 138 (Agaricus)]
 tomentosus (Coprinus cinereus [var.]) G: 634 ← [BH: 402, pl. 138 (Agaricus)]
 tomentosus (Polyporus) Fr: 351, sp. nov.
 torminosus (Agaricus) Fr: 63, not 69, P: 396 ← [Sch 4: 7, pl. 12]
 torminosus (Agaricus lactifluus) Z: 315+ ← [Sch 4: 7, pl. 12 (Agaricus)]
 torminosus (Lactarius) G: 623 ← [Sch 4: 7, pl. 12 (Agaricus)]
 tornatus (Agaricus) Fr: 91, sp. nov.
 torpens (Agaricus) Fr: 299, sp. nov.
 torquatus (Agaricus) Fr: 153, nom. nov.
 tortilis (Agaricus) L: 474, R: 35 ← [Bolt: 41, pl. 41A]
 tortilis (Omphalia) G: 613 ← [Bolt: 41, pl. 41A (Agaricus)]
 tortuosus (Agaricus) Fr: 235, sp. nov.
 tortuosus (Agaricus) Fr: 181 ← [PS: 475]
 trabea (Daedalea) Fr: 335 ← [PS: xxix (Agaricus)]
 trachelinus (Agaricus) Fr: 134 ← [FO 2: 165, "trachilinus"]
 traganus (Agaricus) Fr: 217, nom. nov.
 tragopogi (Albugo) G: 540 ← [LDC: 49 (Uredo)]
 translucens (Agaricus) Fr: 274 ← [DC 6: 43]
 tremelloidea (Peziza) M: 26, SA: 535 ← [BH: 240, pl. 410, fig. 1]
 tremelloides (Auricularia) M: 34, P: 453 ← [BH: 278, pl. 290]
 tremelloides (Morchella) M: 90, Schl: 58 ← [Ventenat, "Mem. 1: 509"] Fr 2: 10
 tremelloides (Thelephora) L: 468, SA: 542 ← [BH: 278, pl. 290 (Auricularia)]
 tremellosus (Merulius) Fr: 327, M: 49 ← [Schr: 139]
 tremellosus (Merulius [sic]) Schl: 58 ← [Schr: 139 (Merulius)]
 tremula (Tremella) LD 22: 306 ← [Nees, "Traité. pl. 15, fig. 144b"]
 tremulaecola (Sphaeria lichenoides var.) M: 146, var. nov.
 tremulus (Agaricus) Fr: 191, P: 237 ← [Sch 4: 53, pl. 244]
 tremulus (Crepidopus epigaeus [var.]) G: 617 ← [Sch 4: 53, pl. 224 (Agaricus)]
 trichaeus (Agaricus) Fr: 108 ← [PS: 451]
 tricholoma (Sphaeria) FSS no. 203 ← ["Fries"]
 tricholoma (Agaricus) Fr: 270 ← [A&S: 188]
 trichopus (Clavaria) Fr: 474 ← [PAH: 182, "thrichopus"]
 tricolor (Agaricus) Fr: 166 ← [A&S: 224 (Agaricus omphaliae var.)]
 tricolor (Agaricus) M: 50 ← [BH: 380, pl. 541, fig. 2]
 tricolor (Dasyscyphus) G: 671 ← [S: p.f.p. 369, fig. 6 (Peziza)]

- trivialis (Agaricus) Fr: 65 ← ["Krapf, Essb. Schw. 1: t. 5, figs. 1-3"]
 trullaeformis (Agaricus) Fr: 184, sp. nov.
 truncata (Sphaeria (Poronia)) FSS no. 182 ← [Bolt: 127, pl. 127A (Sphaeria)] Fr 2: 330
 truncata (Hysterium) Schl: 58 ← [PS: 98]
 truncatus (Agaricus omphalia) Z: 349† ← [Sch 4: 66, pl. 251 (Agaricus)]
 truncigena (Omphalia involuta [var.]) G: 611 ← [PS: 448]
 truncigenus (Agaricus omphalia) Z: 350† ← [PS: 448 (Agaricus involutus var.)]
 tubaeformis (Cantharellus) Fr: 319, G: 636 ← [PS: 489 (Merulius) BH: 294, pls. 208, 461 (Helvella)]
 tubaeformis (Hymenoscyphus) G: 673 ← [Bolt: 106, pl. 106, fig. 1 (Peziza "tuba")]
 tubaeformis (Sphaeria) H: 7 ← [TM 2: 51]
 tuberaster (Polyporus) Fr: 347 ← [PS: 514 (Boletus) ← JColl: Supple. t. 8, 9†]
 tubercularia (Sphaeria) M: 144 ← [DC 2: 295]
 tuberculatum (Trichoderma) G: 560 ← [FOM 1: 12]
 tuberculosa (Sphaeria) P: 488 ← ["Sibthorp"]
 tuberculosum (Xyloma leucocreas var.) M: 149, var. nov.
 tuberculosus (Agaricus) Fr: 244 ← [Sch 4: 34, pl. 79]
 tuberculosus (Polyporus) Fr: 380 ← [DC 6: 40 ← POM 1: 14 (Poria)]
 tuberosa (Agaricus typhoides var.) M: 55, var. nov.
 tuberosa (Clavaria) Fr: 486 ← [S: p.f.p. 199]
 tuberosa (Peziza) M: 24 ← [BH: 266, pl. 485, fig. 3]
 tuberosa (Ramaria) G: 655 ← [S: p.f.p. 199 (Clavaria)]
 tuberosum (Astroma) G: 524 ← [S: p.f.p. 393, fig. 2 (Sphaeria)]
 tuberosus (Agaricus) Fr: 133, M: 72 ← [BH: 548, pls. 256, 522, fig. 4]
 tuberosus (Agaricus hiriolorum var.) M: 74 ← [BH: "pl. 585, fig. 2"]
 tuberosus (Boletus rubeolarium var.) M: 44 ← [BH: 326, pl. 100 (Boletus
 tuberosus (Gymnopus) G: 611 ← [BH: 548, pls. 256, 522, fig. 4 (Agaricus)])]
 tuberosus (Macroscyphus) G: 672 ← [Dick 2: 25 (Peziza)]
 tuber.regium (Agaricus) Fr: 174, sp. nov. ← ["Rumphius, Amboi."]
 tubiforme (Exormatostoma) G: 522 ← [TM 2: 51 (Sphaeria "tubaeformis")]
 tubiformis (Sphaeria) LD 22: 386 ← [TM 2: 51, "tubaeformis"]
 tuboeformis (Merulius) M: 47 ← [PS: 62 ← BH: 294, pl. 208, 461 (Helvella "tubaeformis")]
 tularostoma (Nemaspora) Spr: 310 ← [Ehor: 87]
 tumidum (Hysterium) FSS no. 166 ← ["Fries"]
 tumidus (Agaricus) Fr: 48 ← [PS: 350]
 turbidus (Agaricus) Fr: 205, sp. nov.

turbinatus (Agaricus) Fr: 225, N&B: 311, R: 38 ← [BH: 645, pl. 110]
 turbinatus (Agaricus) M: 81 ← [BH: 645, pl. 110]
 turbinatus (Agaricus congregatus var.) P: 235, stat. nov.
 turundus (Agaricus) Fr: 106 ← [FO 2: 199]
 tylicolor (Agaricus) Fr: 132 ← [FO 2: 128]
 typhina (Nemania) G: 516 ← [PID: 1: 21 (Sphaeria)]
 typhina (Sphaeria) H: 6, N&B: 299, Schl: 59 ← [PID 1: 21]
 typhoides (Agaricus) M: 55, N&B: 319, SA: 565 ← [BH: 405, pls. 16, 582, fig. 2]

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uda (Nemania) G: 516 ← [PD: 3 (Sphaeria)]
 uda (Sphaeria) Schl: 59 ← [PD: 3] Fr 2: 358
 udum (Hydnum) Fr: 422, sp. nov.
 udus (Agaricus) Fr: 292 ← [PS: 414]
 uliginosus (Merulius) Schl: 58, sp. nov.
 ulmarius (Agaricus) Fr: 186, M: 52, P: 200, SA: 561 ← [BH: 582, pls. 216, 510]
 ulmarius (Boletus) P: 242 ← [S: p.f.p. 88]
 ulmarius (Pleuropus) G: 615 ← [BH: 582, pls. 216, 510 (Agaricus)]
 ulmarius (Polyporus) Fr: 365 ← [S: p.f.p. 88 (Boletus)]
 ulmi (Peripherostoma) G: 515 ← [S: p.f.p. 374, fig. 3 (Sphaeria)]
 ulmi (Sphaeria) Schl: 59 ← [S: p.f.p. 374, fig. 3]
 ulmi (Xyloma) P: 317, nom. nov.
 umbellata (Botrytis) M: 14, SA: 528 ← [BH: 105, pl. 504, fig. 8 (Mucor)]
 umbellatus (Boletus) K: 30 ← [PS: 519]
 umbellatus (Polyporus) Fr: 354 ← [PS: 519 (Boletus)]
 umbelliferarum (Hypoderma virgultorum var.) M: 152, var. nov.
 umbelliferus (Agaricus) P: 222 ← [LSP: 1175]
 umbelliferus (Merulius) H: 25 ← [LSP: 1175 (Agaricus)]
 umbilicatum (Circinostoma) G: 521 ← [PS: 45 (Sphaeria)]
 umbilicatus (Agaricus) M: 66, P: 412, SA: 573 ← [BH: 466, pl. 411, fig. 2]
 umbonatus (Xyloma leucocreas var.) M: 149, var. nov.
 umbonatus (Cantharellus) Fr: 317 ← [PD: 26]
 umbratililis (Agaricus) Fr: 157, nom. nov.

- umbrina (Amanita) G: 600, R: 40 ← [PD: 67]
 umbrina (Scodellina) G: 668 ← [POM 2: 77 (Peziza)]
 umbrinus (Agaricus lactifluus) Z: 318+ ← [PS: 435+]
 umbrus (Agaricus) Fr: 200 ← [PIC 1: 8]
 undulata (Sphaeria) H: 5 ← [PS: 21]
 undulatus (Agaricus) M: 70 ← [BH: 462, pl. 535, fig. 2]
 undulatus (Cantharellus) Fr: 321, G: 637 ← [PS: 492 (Merullius)]
 undulatus (Merullius) M: 48, Re: 50 ← [PS: 492]
 unguinosus (Agaricus) Fr: 101, sp. nov.
 unguilatus (Boletus) G: 642, L: 470, M: 41, N&B: 338, SA: 550 ← [Sch 4: 88, pls. 137, 138]
 unicolor (Boletus) L: 470, M: 40, P: 445+, SA: 548, Re: 50 ← [BH: 365, pls. 408, 501, fig. 3]
 unicolor (Campsotrichum) Ehren: 519, Spr: 310 ← [Ehor: 83]
 unicolor (Daedalea) Fr: 336, P: 247+ ← [BH: 365, pls. 408, 501, fig. 3 (Boletus)]
 uranius (Agaricus) Fr: 144 ← [FO 2: 156]
 urbus (Agaricus) Fr, index only
 urbus (Agaricus) Fr: 48, nom. nov. ← [?Sae: 333, "inecurvus"]
 ureolatus (Pilobolus) P: 323 ← [Dick 1: 25 (Mucor)]
 urediniforme (Erineum) N&B: 369, sp. nov.
 uredo (Stilbospora) M: 148, SA: 517+ ← [DC 6: 152+]
 urens (Agaricus) Fr: 232, M: 75, SA: 578 ← [BH: 577, pl. 528, fig. 1]
 ursinus (Agaricus) Fr: 185, sp. nov.
 ursinus (Polyporus) Fr: 361 ← [Link, "Diss.: 38" (Boletus)]
 urticae (Rhytisma) FSS no. 209, sp. nov., Fr 2: 570
 urticae (Tremella) FSS no. 217 ← ["Wild." ← PS: 628] Fr 2: 231
 urticae (Tremella) M: 28, P: 176 ← [PS: 628]
 ustalis (Agaricus) Fr: 37, not 34 ← ["FO 2: 119" not found]
 ustulata (Gyrraria) G: 594 ← [BH: 221, pl. 420, fig. 2 (Tremella)]
 ustulata (Tremella) M: 28, SA: 585 ← [BH: 221, pl. 420, fig. 2]
 uvidus (Agaricus) Fr: 66 ← [FO 2: 191]

- vaccinus (Agaricus) Fr: 42 ← [Sch 4: 13, pl. 25]
 vaga (Phlebia) Fr: 428, sp. nov.
 vagans (Agaricus) Fr: 29, nom. nov.
 vaginatus (Agaricus) Fr: 14, M: 89, N&B: 305, R: 50 ← [BH: 664, pls. 98, 512]
 vahlii (Agaricus) Fr: 240 ← [Sae: 258]
 vaillantii (Agaricus) Fr: 136, nom. nov.
 vaillantii (Boletus) M: 39 ← [DC 6: 38]
 vaillantii (Polyporus) Fr: 383 ← [DC 6: 38 (Boletus)]
 valvatum (Hysterium) LD 22: 400 ← ["Nees, Trait. t. 59, fig. 299"]
 vaporaria (Pratella campestris var.) G: 626 ← [PS: 418 (Agaricus) var. ____)]
 vaporarium (Sclerotium) G: 590 ← [A&S: 73]
 vaporarius (Polyporus) Fr: 382 ← [PAB: 11: 30 (Boletus)]
 varia (Grifolia) G: 644 ← [POM 1: 85 (Boletus)]
 variabilis (Agaricus) Fr: 275, M: 51, SA: 560 ← [POM 2: 46]
 variabilis (Crepidopus) G: 616 ← [POM 2: 46 (Agaricus)]
 varicolor (Agaricus) Fr: 222 ← [PS: 280]
 variegata (Auricularia reflexa var.) M: 34 ← [BH: 282, pl. 274]
 variegata (Daedalea) Fr: 337 ← [FO 2: 240]
 variegata (Mycena) G: 621 ← [PS: 391 (Agaricus)]
 variegatus (Agaricus) Fr: 158 ← [PS: 391]
 variegatus (Boletus) Fr: 388 ← [Swartz, "Vetensk. Akad. Handl. 1810: 8"]
 varium (Erysiphe) FBR: 48 ← [FO 1: 206]
 varium (Hysterium) LD 22: 401 ← [FO 1: 206 (Erysiphe)]
 varium (Sclerotium) FBR: 42, G: 591 ← [PS: 122]
 varium (Sclerotium) M: 131 ← [PS: 122]
 varius (Agaricus) Fr: 225, P: 216 ← [Sch 4: 20, pl. 42]
 varius (Polyporus) Fr: 352 ← [POM 1: 85 (Boletus)]
 varius (Prunulus) G: 631 ← [PS: 414 (Agaricus)]
 vascipes (Agaricus) Fr: index only
 vastator (Merulius) Fr: 329, SA: 557 ← [Tode, "Abh. Hall. Naturf. Gesell. 1: 351"]
 vatricosus (Agaricus) Fr: 259 ← [FO 2: 46]
 vegetatum (Helicosporium) LD 20: 460 ← [NS: Uberbl. 19, "vegetum"]
 vegetum (Helicosporium) G: 557 ← [NS: Uberbl.: 19]
 velatus (Agaricus) P: 185 ← [With: 163]
 vellereus (Agaricus) Fr: 76, nom. nov.

- velutina (Peziza) SA: 531, sp. nov.
 velutinum (Helmisporium) G: 557, LD 20: 495 ← [LM 3: 10]
 velutinum (Hydnum) Fr: 404, nom. nov.
 velutinus (Boletus) P: 447 ← [PAB: 11: 29]
 velutinus (Coprinus) G: 633 ← [PS: 408 (Agaricus)]
 velutinus (Polyporus) Fr: 368 ← [PAB 11: 29 (Boletus)]
 velutipes (Agaricus) Fr: 119, K: 7, P: 196 ← [CFL 4: t. 70]
 velutipes (Gymnopus) G: 605 ← [CFL 4: t. 70 + text (Agaricus)]
 velutipes (Isaria) G: 562 ← [LM 3: 20]
 venosum (Micromphale) G: 622 ← [PS: 467 (Agaricus)]
 ventricosus (Agaricus) Fr: 294, M: 62, N&B: 317 ← [BH: 465, pl. 411, fig. 1]
 vermicularis (Clavaria) Fr: 484 ← [Swartz, "Vetensk. Akad. Handl. 1811: 159"]
 vermiculata (Clavaria) G: 657, H: 30, P: 471 ← [LFS: 1057 Scop: 483]
 verna (Amanita) R: 47 ← [BH: index only† (Agaricus bulbosus)]
 vernus (Agaricus) Fr: 13, L: 477, M: 89, SA: 590 ← [PS: 250 (Amanita) BH: index only† (Agaricus bulbosus)]
 verrucaeformis (Sphaeria) N&B: 298, Schl: 59 ← [PS: 26 "Ehrh. Pl. Crypto. Exs. Dec. 28, no. 280"]
 verrucosa (Amanita) R: 40, nom. nov.
 verrucosus (Agaricus) M: 87, Re: 53, SA: 589 ← [BH: 672, pl. 316]
 verrucosus (Agaricus) P: 202 ← [Bolt: 42, pl. 42]
 versicolor (Agaricus) Fr: 286 ← [With: 166]
 versicolor (Boletus) G: 642, H: 27, L: 470, M: 40, N&B: 339, P: 434, SA: 549, Schl: 56 [LSP: 1176]
 versicolor (Hysterium) LD 22: 371 ← [WFL: 522]
 versicolor (Polyporus) Fr: 368 ← [LSP: 1176 (Boletus)]
 versicolor (Thelephora) Fr: 438 ← [SIN 3: 1934]
 verticillatum (Acremonium) G: 550 ← [LM 3: 15]
 vervacti (Agaricus) Fr: 263, sp. nov.
 vesiculosa (Peziza) H: 33, N&B: 348, P: 461, SA: 534 ← [S: p.f.p. 4] Fr 2: 52
 vesiculosa (Peziza) M: 25 ← [BH: 270, pis. 44, 457, fig. 1]
 vesiculosa (Scodellina) G: 669 ← [S: p.f.p. 4 (Peziza)]
 vespertinus (Agaricus) Fr: 233, sp. nov.
 vibratilis (Agaricus) Fr: 227, sp. nov.
 vietus (Agaricus) Fr: 66, nom. nov.

- villosa (Typhula) Fr: 495 ← [Sae 2: 406 (Clavaria)]
 villosum (Stilbum) M: 18 ← [BH: 110, pl. 504, fig. 15 (Mucor)]
 villosus (Agaricus) M: 77 ← [BH: 572, pl. 214]
 villosus (Polyporus) Fr: 344 ← [SIN 3: 1923 (Boletus)]
 vinctoxici (Sphaeria punctiformis var.) Schl: 59, var. nov.
 vinosus (Agaricus) M: 69 ← [BH: index only†, pl. 54]
 vinosus (Agaricus nudus [var.]) SA: 582, var. nov.
 violacea (Auricularia tremelloides var.) M: 34 ← [BH: 278, pl. 290]
 violacea (Cortinaria) G: 628 ← [LSP: 1173 (Agaricus)]
 violacea (Gyria) G: 594 ← [Relh: 442 (Tremella)]
 violacea (Peziza stercoraria var.) M: 22 ← [BH: 256, pl. 376]
 violacea (Peziza stercoraria [var.]) SA: 532 ← [BH: 256, pl. 376]
 violacea (Peziza tremelloidea var.) M: 26 ← [BH: 240, pl. 410]
 violacea (Scodellina) G: 669 ← [BH: 256, pl. 376 (Peziza stercoraria var.)]
 violacea (Thelactis) MNA: 508, sp. nov.
 violacea (Tremella mesenteriformis var.) M: 28 ← [BH: 230, pl. 272]
 violaceo-cinereus (Agaricus) Fr: 217 ← [PCS: 2]
 violaceo-fulvus (Agaricus) Fr: 276 ← [BEF: 95]
 violaceo lamellatus (Agaricus) M: 59† ← [DC 2: 153, "violaceo-lamellatus"]
 violaceum (Dematium) H: 34 ← [PS: 697]
 violaceum (Sistotrema) Schl: 59 ← [PS: 551]
 violaceus (Agaricus) Fr: 217, H: 20, L: 475, P: 406 ← [LSP: 1173]
 violaceus (Agaricus araneosus var.) M: 82, SA: 583 ← [BH: index only†, (Agaricus araneosus-violaceus)]
 violaceus (Cantharellus) Fr: 319 ← [FO 2: 235 (Merullius)]
 violaceus (Polyporus) Fr: 379 ← [FO 2: 263]
 violae (Granularia) ← [S: p.f.p. 440]
 violascens (Agaricus) Fr: 75 ← ["Otto: 34"]
 violascens (Himantia) LD 21: 164 ← [FO 1: 211]
 violascens (Hydnium) Fr: 401 ← [A&S: 265]
 violascens (Thelephora) Fr: 451 ← [FO 1: 211 (Himantia)]
 vires (Thelactis) MNA: 508, sp. nov.
 virescens (Agaricus) N&B: 327 ← [Sch 4: 40, pl. 94]
 virescens (Agaricus (russula)) K: 21† ← [Sch 4: 40, pl. 94 (Agaricus)]
 virescens (Agaricus russula) Z: 352† ← [Sch 4: 40, pl. 94 (Agaricus)]
 virescens (Aspergillus) G: 555 ← [LM 3: 16, "virens"]
 virgae aureae (Xyloma) M: 150† ← [LDC: 65†]

- virgata (Amanita) R: 50 ← [PS: 249 (Amanita) ← PD: 18 (Agaricus)]
 virgata (Clavaria) Fr: 472, sp. nov.
 virgata (Vaginata) G: 601 ← [PD: 18 (Agaricus)]
 virgata (Agaricus) Fr: 48 ← [FO 2: 113]
 virginea (Omphalia) G: 613 ← [WJ 2: 104 (Agaricus)]
 virginea (Peziza) H: 33 ← [BEF: 125]
 virgineus (Agaricus) Fr: 100, not 200, R: 35 ← [WJ 2: 104]
 virgineus (Agaricus omphalia) Z: 345+ ← [WJ 2: 104 (Agaricus _____)]
 virgineus (Dasyscyphus) G: 671 ← [BEF: 125 (Peziza)]
 virgultorum (Hypoderma) SA: 515, LD 22: 370, M: 152 ← [DC 6: 165]
 viride (Geoglossum) Fr: 489, G: 659 ← [PCC: 40]
 viride (Hydnum) Fr: 421 ← [A&S: 262 (Sistotrema)]
 viride (Trichoderma) G: 560 ← [PD: 12]
 viridescens (Agaricus adonis var.) M: 64, var. nov.
 viridis (Agaricus) Fr: 90, N&B: 306 ← [HUDS: 614, "viridis" ← Scop: 437, "virens"]
 viridis (Amanita) R: 46 ← [PS: 251 ← PD: 67]
 viridis (Gymnopus) G: 606 ← [HUDS: 614 (Agaricus) Scop: 437 (Agaricus "virens")]
 viridis (Peziza callosa var.) M: 21 ← [BH: 252, pl. 376]
 viridis (Sphaeria) G: 528 ← [S: p.f.p. 375, fig. 8]
 viridis (Agaricus) P: 417, sp. nov.
 viscosa (Cortinaria) G: 629 ← [LSP: 1173 (Agaricus)]
 viscosa (Clavaria) Fr: 486, not 488 ← [FRNB: 117]
 viscosa (Thelephora) Fr: 448 ← [PS: 580 (Thelephora) ← POM 2: 18 (Corticium)]
 viscosum (Geoglossum) Fr: 489 ← [PS: 609]
 viscosus (Agaricus) P: 208, nom. nov.
 vitellina (Russula) G: 618 ← [PS: 442 (Agaricus russula _____)]
 vitellinum (Polyangium) G: 587 ← ["Ditmar in Sturm, Germ. 3: 2"]
 vitis (Erineum) N&B: 368, M: 16, Schl: 57 ← [DC 6: 74 ← "Schrad. & Schleich., crypto. exs. no. 100"]
 vitis (Hypoderma virgultorum var.) M: 152, var. nov.
 vitis (Xyloma) Schl: 61, sp. nov.
 vitreus (Agaricus) Fr: 146, sp. nov.
 vitreus (Boletus) Schl: 56 ← [POM 1: 15]
 vitreus (Polyporus) Fr: 381 ← [POM 1: 15 (Boletus)]
 vitulinus (Gymnopus pratensis [var.]) G: 604 ← [PS: 305 (Agaricus _____ var. _____)]

vogesiaca (Clavaria) Schl: 56 ← ["P[ersoon?]"]
 volemus (Agaricus) Fr: 69, nom. nov.
 volvaceus (Agaricus) Fr: 278, HFD 12: t. 1731, M: 89 ← [S: p.f.p. 1]
 vulgare (Auriscalpium) G: 650, nom. nov.
 vulgare (Stilbum) G: 564, M: 18 ← [TM 1: 10] Fr 3: 305
 vulgaris (Agaricus) Fr: 156 ← [PD: 24]
 vulgaris (Ascophora) G: 561, nom. nov.
 vulgaris (Cantharellus) G: 636, sp. nov.
 vulgaris (Morehella) G: 662, nom. nov.
 vulgaris (Mucor mucedo [var.]) H: 14, var. nov.
 vulgaris (Polyactis) G: 553 ← [LM 3: 16]
 vulgaris (Polyporus) Fr: 381, nom. nov.
 vulgaris (Poria) G: 639, nom. nov.
 vulgaris (Thelephora hirsuta [var.]) H: 29 ← [PS: 570]
 vulgaris (Tubercularia) G: 547, H: 9, L: 484, M: 129, N&B: 302, SA: 615, Schl: 60
 [TM 1: 18] Fr 3: 464
 vulpinus (Agaricus) Fr: 273 ← [S: p.f.p. 361]
 vulpinus (Polyporus) Fr: 361 ← [Link, "Diss.: 38" (Boletus)]

-- X --

xantha (Sphaeria) Schl: 59 ← ["Fries"]
 xanthopus (Agaricus) Fr: 124, not 121 ← [FO 1: 12]
 xanthopus (Polyporus) Fr: 350, not 360 ← [FO 2: 255 (as "Polypdrus")]
 xanthus (Polyporus) Fr: 379 ← [FO 1: 128]
 xerampelinus (Agaricus) F: 210 ← [WBA 3: 331]
 xilophilus (Agaricus) SA: 583 ← [BH: 642, pl. 530, fig. 2, "xylophilus"]
 xylomoides (Hypoderma) G: 510, LD 22: 369, M: 151, Re: 54 ← [LDC: 64]
 xylomoides (Sphaeria) FSS no. 144, sp. nov.: Fr 2: 555
 xylomoides (Sphaeria) M: 140, N&B: 298 ← [DC 2: 288]
 xylophilus (Agaricus) M: 82 ← [BH: 642, pl. 530, fig. 2, "xylophilus"]
 xylophilus (Agaricus) P: 414 ← [BH: 642, pl. 530, fig. 2]
 xylostei (Sphaeria) FSS no. 189 ← ["POM"] Fr 2: 487
 xylostei (Xyloma) M: 149, SA: 518 ← [DC 6: 154]

-- Z --

zephyrus (Agaricus) Fr: 147 ← [FO 2: 161] [BH: 491, pl. 104]
 zonarius (Agaricus) M: 53, P: 398, SA: 563 ← [BH: 491, pl. 104 (Agaricus _____)]
 zonarius (Agaricus lactifluus) R: 29+ ← [BH: 491, pl. 104 (Agaricus _____)]
 zonatus (Polyporus) Fr: 368 ← [NS: Uberbl. 57 (Boletus apus _____)]

MYCOTAXON

Vol. VI, No. 1, pp. 127-166

July-September 1977

AN ANNOTATED INDEX FOR BULLIARD'S "HISTOIRE DE CHAMPIGNONS."

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Summary

A nomenclatural index to the names in the "Histoire" is furnished, together with notes on the origination of these names and their "validity".

No shortage of biographical or bibliographical literature exists on Jean Baptiste Francois Bulliard (1752-1793) (cf. Stafleu & Cowan, 1976), but oddly, no comprehensive index to the fungus names in "Histoire des Champignons" (Bulliard, 1791) has ever appeared. Concordances attempting to correlate the names in the "Histoire" to more modern equivalents have been plentiful (cf. Stafleu & Cowan, 1976: 406).

Bulliard's influence on subsequent mycologists and, therefore, on mycological taxonomy was immense (Gilbert, 1952). His illustrations, carefully conceived and executed, often constituted the best representation of the taxa involved and surely were an improvement over preceding illustrated works. Although no aids (i.e. keys) for systematic classification were offered, taxa were grouped by genus in the text so reference to them was not difficult, and the descriptions of the fungi and their habits were unusually detailed. Nevertheless, several important aspects of this work have not been adequately discussed or summarized, and it is to these ends that this annotated index is offered. The points which have particularly engaged my attention are as follows:

1. Just at this time, our nomenclatural system of multiple starting points is under scrutiny. Two philosophies seem emergent, and one will surely be adopted as the *modus operandi* for the foreseeable future. The first (adopted in 1910) sets multiple starting points (ICBN, Art. 13, cf. Stafleu, et al.) for fungi with the majority dating valid publication from 1 January 1821. All pre-starting point names are "devalidated," or rendered invalid by the imposition of the later starting points. An alternative proposal (now under consideration by a subcommittee of the International Mycological Association

Nomenclature Commission) would adopt certain "sanctioning books" (Persoon's "Synopsis;" Fries's "Systema" and "Elenchus"), the names adopted therein to be preserved against all prior competitors, both taxonomic and nomenclatural. *Names not adopted in these books would revert to a starting point of 1 May 1753 (Linnaeus's "Species Plantarum", ed. 1).*

Because it is important to know the origin of the names in the starting point (and near-starting point) publications, a series of papers on names used in 1821 has already been produced (Petersen, 1975, etc.). In view of the alternative proposal outlined above, however, this is not enough, and it becomes equally important to know the history of pre-starting point names, especially those which *were not* adopted in the starting point books. Scrutiny of Bulliard's "Histoire" offers just such an opportunity.

2. Examination of the "Histoire" quickly increases confusion on the way toward restoring (or attaining) order. For example, the plates for the "Histoire" were all personally supervised by Bulliard, and were ready for distribution well in advance of the text. But there was no direct correlation between the order of taxa in the text and the number of corresponding plate (that is, the 23rd taxon of the text did not appear as plate 23, as arranged, for instance, by Sowerby), nor did the page numbers correspond with plate numbers, as they were made to do by Bolton. The possibility exists that the plates were issued piecemeal in order to correspond to the text for those taxa, although no record of such lack of order is to be found. What seems more likely, although less utilitarian, is that the subscriber often had to wait for an extended period before receiving the plates to accompany text already published, and received plates the text for which was not simultaneously forthcoming.

At the same time, Bulliard took on a partner in Etienne Pierre Ventenat (1757-1808, *teste* Pritzel), who coauthored a portion of the second volume of the "Histoire". When Bulliard died during the production of the publication Ventenat became the sole author, although the preparation had been made by Bulliard and the plates already produced. Only certain names used in "Histoire" can be attributed to Bulliard; others must be cited as "Bulliard and Ventenat", and still others attributed to Ventenat alone, or more completely (but outside the ICBN) to "Bulliard *apud* Ventenat." Because names must be linked to the text, the following summary of author citations in "Histoire" may be followed:

pp. 1-368 (1791) Bulliard
 pp. 369-372 (1809) Bulliard and Ventenat
 pp. 373-508 (1792) Bulliard
 pp. 509-540 (1809) Bulliard and Ventenat
 pp. 541-700 (1812) Bulliard apud Ventenat

3. By a quick count, I find 543 *new* names in the "Histoire." But examination of the text reveals that many of these names were not for "new" taxa, but only renamings of taxa with acceptable prior names. These prior names were listed as synonyms, some followed by "?", indicating a doubtful synonym. Nevertheless, when Bulliard and/or Ventenat *renamed* a taxon, the "Histoire" name was clearly superfluous. Again, a superficial count reveals 213 such names, or 40% of the total new names.

The literature available to Bulliard and Ventenat was apparently severely limited, if author citations are any measure. Perhaps most often cited was Schaeffer (cf. Petersen, 1976), followed by Bolton (cf. Petersen, 1977), Batsch, Hoffmann, and Linnaeus ("Species Plantarum," 2nd Ed - the edition of choice at that time). Two other authors, Bergeret and Pauli, were minor contributors, and I have been unable to locate the Pauli reference. Curtis, Jacquin, Withering, and Dickson are hardly mentioned, and such important authors as Scopoli (whose names were attributed to Schaeffer), Holmskjold, Hudson, Roth, Swartz, Tode, and Willdenow seem to have gone unnoticed.

4. It is apparent that Ventenat did not always agree with Bulliard's taxonomy, for in compiling the final index (to plates, and only then to taxa and pages), Ventenat took the opportunity to change many names used by Bulliard in earlier text and on the plates. Two problems occur, however. First; Ventenat's names are total substitutions for Bulliard's, and are therefore totally superfluous nomenclaturally (although not *nomina nuda*, for they refer directly to adequate descriptions by Bulliard). Second; most of these substitute names are really attributable to prior authors (Ventenat apparently was more conservative than Bulliard and wished to return to prior names), but were not so cited, forcing the attribution on Ventenat, not the prior author. In such cases, these names are later homonyms of the prior names.

5. By comparison of the "Histoire" names to the later starting point books ("Synopsis," "Systema," "Elenchus"), I conclude that 188 names originating in "Histoire" were adopted in starting point literature. These presumably will be preserved under any system now being considered. Of those names, however, 56 are based on *nomina superflua*, fully 30%.

On the contrary, for those names *not* adopted in later starting point books, nomenclatural history is equally important. Under the present system, most "Histoire" names *were* validated by one or more post-starting point authors. For example, especially Mérat, St. Amans, Léman, and Laterrade adopted "Histoire" names in 1821 (cf. Petersen, 1975, etc.). These names are "safe" under the present system of starting points. If such shelter is removed (alternative proposal under point 1 above) from pre-starting point names *not* adopted in starting point books, competition for validity will start on 1 May 1753, and all appropriate *nomina superflua* in the "Histoire" will become unsheltered, and will give way to prior names (see point 3 above). This number would be very substantial, perhaps as high as 150.

6. All of the above is simply nomenclatural, or bibliographic, not taxonomic. Aside from obligatory or nomenclatural synonyms based on substitute names, additional taxonomic synonymy may well be identified.

7. Were all the contemporary publications bolstered by herbaria, typification of names would secure them to taxonomic concepts. Neither Bulliard nor most of his predecessors were able to preserve specimens, however, and this vital link is virtually completely lacking. Synonymy must be based, therefore, on circumscriptions and illustrations, providing few of the characters necessary for modern taxonomy.

Briefly, the following can be stated. Late 18th century mycological taxonomists liberally supplied "new" names to taxa which had already been named, and the actual name-givers were few in number, making the sorting of these *names* a relatively simple task. Conversely, taxonomic perception had not been sharpened, and taxonomic concepts were extremely broad by modern standards. The answer ultimately will lie with neo-typification of these names, for which the ground rules have been clearly written, but imperfectly followed.

The Index

Column 1. Names are arranged alphabetically regardless of genus. The fungus name is followed by the correct author citation, whether originating in the "Histoire" or not. Accurate citations to originating literature for non- "Histoire" names are provided in the Notes to the Index, by number (i.e. *Peziza acetabulum* Linnaeus, note 1).

Column 2. Page number in the text where the fungus is named, although discussion may extend farther. "Index" indicates a Ventenat substitute included only in the "Histoire" index after vol. 2. No common names (which appear as the sole name on several plates) are indexed.

Column 3. Plates and figures in which the named taxon appear. Some taxa, especially varieties and subvarieties, are not clearly cited in the "Histoire" as illustrated, and these are so indicated.

Column 4. A key to self-explanatory notes which are included as an appendix. Literature abbreviations in the notes are from Petersen (1975, etc.).

Column 5. Nomenclatural status of each name originating in the "Histoire". Pre-"Histoire" names are not judged. For superfluous names, the oldest name for the same taxon is included in the Notes to the Index, often along with additional synonyms.

Column 6. Names adopted in starting point books, as follows:

F = Fries: "Systema" and/or "Elenchus".

F* = Fries recombined the name in the starting point book.

P = Persoon: "Synopsis" (for Gasteromycetes).

P* = Persoon recombined the name.

Only fungi with later starting points are indicated (Myxomycetes start on 1 May 1753).

<u>Name and Authority</u>	<u>Page</u>	<u>Plate</u>	<u>Note No.</u>	<u>Nom. Status</u>	
abietinus (Agaricus) Bulliard & Ventenat	379	442, fig. 2; 541, fig. 1		sp. nov.	F*
acanthoides (Boletus) Bulliard	337	486		sp. nov.	F*
acerbus (Agaricus) Bulliard apud Ventenat	603	571, fig. 2		sp. nov.	F
acetabulum (Peziza) Linnaeus	267	485, fig. 4		sp. nov.	
acicularis (Helvella) Bulliard	296	473, fig. 1	1	nom. superfl.	F*
acris (Agaricus) Bulliard	500	200; 538	2	nom. superfl.	
aculeiformis (Clavaria) Bulliard	214	463, fig. 4	3	sp. nov.	F
adonis (Agaricus) Bulliard	445	560, fig. 2	4	nom. superfl.	F
aereus (Boletus) Bulliard	321	385		sp. nov.	F
agryraeus (Agaricus) Bulliard apud Ventenat	584	423, fig. 1	5	nom. superfl.	
aimatochelis (Agaricus) Bulliard apud Ventenat	660	527, fig. 1; 596, fig. 1			F
aimatospermus (Agaricus) Bulliard apud Ventenat	638	595, fig. 1	281		
alba (Auricularia papyrina var.) Bulliard	279	402		var. nov.	
alba (Clavaria coralloides var.) Bulliard	201	358, fig. C; 496, fig. L, M, P		var. nov.	
alba (Clavaria muscoides var.) Bulliard	203	358, fig. A		var. nov.	
albae (Helvella elastica var.) Bulliard	299	242, figs. A, B, D-G		var. nov.	
alba (Helvella mitra var.) Bulliard	298	190, figs. A-C, F; 466, fig. A		var. nov.	
alba (Peziza callosa var.) Bulliard	252	-----		var. nov.	
alba (Peziza cyathoidea var.) Bulliard	250	-----		var. nov.	
alba (Peziza fructigena var.) Bulliard	236	228, figs. C, D		var. nov.	
alba (Peziza imberbis var.) Bulliard	245	467, fig. 2		var. nov.	
alba (Peziza labellum var.) Bulliard	262	204		var. nov.	
alba (Peziza papillaris var.) Bulliard	244	-----		var. nov.	
alba (Peziza stipitata var.) Bulliard	271	457, fig. II, S, T, X, Z		var. nov.	
alba (Peziza vesiculosa var.) Bulliard	270	457, fig. I, E, F, H		var. nov.	

alba (Reticularia) Bull.	92	326	sp. nov.
alba (Tremellia cerebrina var.) Bulliard	221	386, fig. A	var. nov.
album (Tuber) Bulliard	80	404	sp. nov.
albus (Boletus suberosus var.) Bulliard	354	482, fig. F	var. nov.
albus (Phallus esculentus var.) Bulliard	274	-----	var. nov.
albus (Sphaerocarpus) Bulliard	137	407, fig. 3; 470, fig. 1	nom. superfl.
alliaceus (Agaricus) "Schaeffer"	551	158; 524, fig. 1	
alnicus (Agaricus) Linnaeus	381	346; 581, fig. 1	
amadelphus (Agaricus) Bulliard & Ventenat	537	550, fig. 3	F
amarus (Agaricus) Bulliard	478	32; 178; 398; 562	nom. superfl.
amethystea (Auricularia reflexa var.) Bulliard	282	483, fig. IA-F	var. nov.
amethystea (Clavaria) Bulliard	200	496, fig. 2	nom. superfl.
amethystea (Tremella) Bulliard	229	499, fig. 5	nom. superfl.
amethysteus (Agaricus) "Bolton"	559	198; 570, fig. 1	
androsaceus (Agaricus) Linnaeus	544	64; 569, fig. 3	
annularius (Agaricus) Bulliard apud Ventenat	626	92; 377; 540, fig. 3; 543	nom. superfl.
annularius (Boletus) Bulliard	316	332	nom. superfl.
anthocephala (Clavaria) Bulliard	197	452, fig. 1	sp. nov.
antiades (Sphaerocarpus) Bulliard	127	368, fig. 2	sp. nov.
appendiculatus (Agaricus) Bulliard	442	392	sp. nov.
aquosus (Agaricus) Ventenat	index	17	nom. superfl.
araneosa (Peziza) Bulliard	264	280	sp. nov.
araneosus (Agaricus) Bulliard apud Ventenat	cf. note	cf. note	
araneosus-violaceus (Agaricus) Ventenat	index	250	
arcuatus (Agaricus) Bulliard apud Ventenat	595	443; 589, fig. 1	F
ardosiacea (Peziza callosa var.) Bulliard	252	416, fig. 1	var. nov.
ardosiaceum (Lycoperdon) Bulliard	146	192	nom. superfl.
ardosiaceus (Agaricus) Bulliard	472	348	sp. nov.
argyraceus (Agaricus) Bulliard apud Ventenat	584	513, fig. 2	sp. nov.

argyrospermus (Agaricus) Bulliard apud Ventenat	604	602			sp. nov.
articulatus (Mucor) Bulliard	110	504, fig. 14			sp. nov.
arundinaceus (Agaricus) Bulliard	458	403, fig. A			sp. nov.
aspergillus (Mucor) Bulliard	106	504, fig. 10			sp. nov.
atramentarius (Agaricus) Bulliard	413	164			sp. nov.
atro-virens (Tremella) Bulliard	225	184		19	nom. superfl.
aurantiaca (Clavaria muscoides var.) Bulliard	203	358, fig. A			var. nov.
aurantiaca (Peziza) Ventenat	index	10		21	nom. superfl.
aurantiacus (Agaricus) Bulliard apud Ventenat	666	120		22	nom. superfl.
aurantiacus (Boletus) Bulliard	320	236; 489, fig. 2		23	sp. nov.
aurantium (Lycoperdon) Linnaeus	158	270			sp. nov.
aurantius (Mucor) Bulliard	103	504, fig. 5			F*
aurantius (Sphaerocarpus) Bulliard	133	484, fig. 2			sp. nov.
aureus (Agaricus) Ventenat	index	92		24	nom. superfl.
auricula-judae (Auricularia) Bulliard	241	[410]		25	nom. superfl.
auricula-judae (Peziza) Ventenat	index	427, fig. 2		26	nom. superfl.
auricula-judae (Tremella) Bulliard	224	427, fig. 2		27	nom. superfl.
auriscalpium (Hydnum) Linnaeus	303	481, fig. 3		28	nom. superfl.
axifera (Trichia) Bulliard	118	477, fig. 1		29	nom. superfl.
azonites (Agaricus) Bulliard	497	559, fig. 1; 567, fig. 3			sp. nov.
- B -					
barba-jobi (Hydnum) Bulliard	303	481, fig. 2			sp. nov.
betulinus (Boletus) Bulliard	348	312			F*
biennis (Boletus) Bulliard	333	449, fig. 1			F*
bifidus (Agaricus) Ventenat	index	26		30	nom. superfl.
bifurca (Clavaria) Bulliard	207	264		31	nom. superfl.
bovista (Lycoperdon) Linnaeus	154	447		32	sp. nov.
brevipes (Agaricus) Bulliard apud Ventenat	594	521, fig. 2			

buglossoides (Fistulina) Bulliard	314	74; 464; 497	33	nom. superfl.
bulbosus (Agaricus) Schaeffer	670	2; 108; 577	34	
bullaceus (Agaricus) Bulliard	421	566, fig. 2		sp. nov.
butyraceus (Agaricus) Bulliard and Ventenat	615	572		sp. nov.
byssoides (Clavaria) Bulliard	209	415, fig. 2	35	nom. superfl.
- C -				
caelatum (Lycoperdon) Bulliard	156	430	36	nom. superfl.
calceolus (Boletus) Bulliard	338	46; 360; fig. 2		sp. nov.
callosa (Peziza) Bulliard	252	376, fig. 4, 416, fig. 1	37	nom. superfl.
cameleon (Agaricus) Bulliard & Ventenat	562	545, fig. 1	38	nom. superfl.
campanulatus (Agaricus) Linnaeus	431	552, fig. 1	39	
camphoratus (Agaricus) Bulliard	493	224; 567, fig. 1	40	nom. superfl.
cantharelloides (Agaricus) Bulliard	507	505, fig. 2		sp. nov.
cantharelloides (Helvella) Bulliard	297	473, fig. 3	41	nom. superfl.
cantharellus (Agaricus) Linnaeus	505	62; 505, fig. 1	42	
capniocephalus (Agaricus) Bulliard apud Ventenat	570	547, fig. 2		sp. nov.
capsulifer (Sphaerocarpus) Bulliard	139	470, fig. 2	43	nom. superfl.
caput-medusae (Clavaria) Bulliard	210	412		sp. nov.
carneus (Agaricus) Bulliard apud Ventenat	555	533, fig. 1		sp. nov.
carnosa (Reticularia) Bulliard	85	424, fig. 1		sp. nov.
cartilagineus (Agaricus) Bulliard apud Ventenat	596	589, fig. 2	282	sp. nov.
caryophyllea (Auricularia) (Schaeffer) Bulliard	284	278; 483, figs. 6-7	44	
castaneus (Agaricus) Bulliard apud Ventenat	658	268; 527, fig. 2		sp. nov.
castaneus (Boletus) Bulliard	324	328		sp. nov.
caulicinalis (Agaricus) Bulliard apud Ventenat	545	522, fig. 1		sp. nov.

cepaeforme (Lycoperdon) Ventenat	index	435, fig. 2	45	nom. superfl.	
cepaeforme (Lycoperdon proteus var.) Bulliard	148	435, fig. 2		var. nov.	
ceratosperma (Variolaria) Bulliard	184	432, fig. 1		sp. nov.	
cerea (Peziza) Ventenat	index	44	46	nom. superfl.	F
cerebrina (Tremella) Bulliard	221	386	47	nom. superfl.	
chrysenteron (Agaricus) Bulliard apud Ventenat	565	556, fig. 1		sp. nov.	
chrysenteron (Boletus) Bulliard	328	4; 393; 490, fig. 3	48	nom. superfl.	F
chrysocoma (Peziza) Bulliard	254	376, fig. 2		sp. nov.	F
chrysocoma (Tremella) Ventenat	index	174	49	nom. superfl.	
chrysosperma (Reticularia) (Bulliard) Ventenat	index	476	50		
chrysospermus (Mucor) Bulliard	99	504, fig. 1		sp. nov.	F*
chrysospermus (Sphaerocarpus) Bulliard	131	417, fig. 4	51	nom. superfl.	
cibarium (Tuber) Bulliard	74	356		sp. nov.	
ciliare (Hypoxylon) Bulliard	173	468, fig. 1		sp. nov.	F*
ciliata (Peziza) Bulliard	257	438, fig. 2	52	sp. nov.	
cinerea (Auricularia caryophyllea var.) Bulliard	284	483, fig. VII		var. nov.	
cinerea (Auricularia papyrina var.) Bulliard	280	-----		var. nov.	
cinerea (Auricularia reflexa var.) Bulliard	282	483, fig. IV		var. nov.	
cinerea (Clavaria) Bulliard	204	354		sp. nov.	F
cinerea (Peziza imberbis var.) Bulliard	245	-----		var. nov.	
cinerea (Peziza papillaris var.) Bulliard	244	467, fig. I		var. nov.	
cinerea (Trichia) Bulliard	120	477, fig. 3		sp. nov.	
cinereo-fuliginea (Tremella vesicaria var.) Bulliard	224	427, fig. 3		var. nov.	
cinereus (Agaricus) Bulliard apud Ventenat	598	428, fig. 2		sp. nov.	
cinereum (Hydnum) Bulliard	309	419	53	nom. superfl.	F
cinereus (Agaricus) Ventenat	index	88	54	nom. superfl.	F

cinereus (Phallus esculentus var.) Bulliard	274	218, fig. A-D, G	var. nov.
cinnabaris (Trichia) Bulliard	121	502, fig. 1	nom. superfl.
cinnabarina (Tremella) Bulliard	218	455, fig. 2	sp. nov.
cirratum (Hypoxylon) (Hoffm.) Bulliard	172	487, fig. 4	comb. nov.
clandestina (Peziza) Bulliard	251	416, fig. 5	sp. nov.
clavatum (Hypoxylon) Bulliard	171	444, fig. 5	sp. nov.
clavus (Agaricus) Linnaeus	541	148; 569, fig. 1	
clypeolarius (Agaricus) Bulliard	482	405; 506, fig. 2	sp. nov.
coccinea (Peziza) Jacquin	269	474	
coccinea (Trichia cinnabaris var.) Bulliard	121	502, fig. 1	var. nov.
coccineum (Hypoxylon) Bulliard	174	495, fig. 2	sp. nov.
coccineus (Agaricus) Schaeffer	560	202; 570, fig. 2	
coccineus (Boletus) Bulliard	364	501, fig. 1	sp. nov.
coccineus (Sphaerocarpus) Bulliard	126	368, fig. 1	nom. superfl.
cochleata (Peziza) (Wulf. in Jacq.) Bulliard	268	154	
colubrinus (Agaricus) Bulliard	484	78; 583	nom. superfl.
columbarius (Agaricus) Bulliard apud Ventenat	575	413, fig. 1	nom. superfl.
communis (Boletus) Ventenat	index	393	nom. superfl.
conchatus (Agaricus) Ventenat	index	298	nom. superfl.
congregatus (Agaricus) Ventenat	index	94	nom. superfl.
conocephalus (Agaricus) Bulliard	449	563, fig. 1	nom. superfl.
contiguus (Agaricus) Bulliard & Ventenat	518	54; 240; 576, fig. 2	nom. superfl.
contortus (Agaricus) Ventenat	index	36	nom. superfl.
coprophilus (Agaricus) Bulliard	423	566, fig. 3	sp. nov.
coralloides (Clavaria) Linnaeus	201	222; 358, figs. B-E; 496, fig. 3	
coralloides-cinerea (Clavaria) Ventenat	index	354	nom. superfl.
coriacea (Clavaria) Bulliard	198	452, fig. 2	sp. nov.
coriacea (Peziza) Bulliard	258	438, fig. 1	sp. nov.
			F*

coriaceus (Agaricus) Bulliard	373	394; 414; 537	72	nom. superfl.	
coriaceus (Boletus) Scopoli	334	28; 449, fig. 2	73		
cornucopioides (Agaricus) Ventenat	index	208	74	nom. superfl.	
cornucopioides (Helvella) (Linnaeus) Bulliard	291	150; 498, fig. 3	75	comb. nov.	
cornucopioides (Peziza) Linnaeus	index	150	76		
cornuta (Clavaria) Bulliard	193	180	77	nom. superfl.	F
coronata (Peziza) Bulliard	251	416, fig. 4	78	nom. superfl.	F
coronilla (Agaricus) Bulliard apud Ventenat	633	597, fig. 1	79	nom. superfl.	
corrugata (Variolaria) Bulliard	187	432, fig. 4		sp. nov.	
corticalis (Agaricus) Bulliard	475	519, fig. 1		sp. nov.	F
crenata (Peziza) Bulliard	261	396, fig. 3	80	nom. superfl.	F
cretaceus (Agaricus) Bulliard apud Ventenat	636	374		sp. nov.	
crinata (Peziza) Bulliard	249	416, fig. 2		sp. nov.	F
crispa (Helvella) Bulliard	293	465, fig. 1	81	nom. superfl.	
croceus (Agaricus) Bulliard & Ventenat	553	50; 524, fig. 3	82	nom. superfl.	
crustaceus (Wuor) Bulliard	100	504, fig. 2		sp. nov.	
crustuliniformis (Agaricus) Bulliard apud Ventenat	589	308; 546	83	nom. superfl.	
cryptarum (Boletus) Bulliard	350	478		sp. nov.	F*
cupularis (Agaricus) Bulliard & Ventenat	529	554, fig. 2		sp. nov.	F
cuticularis (Boletus) Bulliard	350	462		sp. nov.	F*
cyanescens (Boletus) Bulliard	329	369		sp. nov.	F
cyanus (Agaricus) Bolton	641	170; 530, fig. 1	84		
cyathiforme (Hydnum) Schaeffer	308	156	85		
cyathiformis (Agaricus) Bulliard & Ventenat	512	248; 568, fig. 1	86	nom. superfl.	F
		575			
cyathiformis (Cellularia) Ventenat	index	414	87	nom. superfl.	
cyathoides (Peziza) Bulliard	250	416, fig. 3	88	nom. superfl.	F
cylindrica (Clavaria) Bulliard	212	463, fig. 1	89	nom. superfl.	
cylindricus (Sphaerocarpus) Bulliard	140	470, fig. 3		sp. nov.	

dasypodius (Agaricus) Bulliard apud Ventenat	648	96		90	nom. superfl.	
deliquescent (Agaricus) Bulliard	409	437, fig. 2; 558		91	nom. superfl.	F
deliquescent (Tremella) Bulliard	219	455, fig. 3			sp. nov.	
dendroides (Mucor) Bulliard	105	504, fig. 9			sp. nov.	F*
digitaliformis (Agaricus) Bulliard	435	22; 525, fig. 1		92	nom. superfl.	
digitata (Clavaria) Linnaeus	192	220		93		
dimidiata (Helvella) Bulliard	290	288; 498, fig. 2			sp. nov.	
dimidiatus (Agaricus) Schaeffer	385	298; 508; 517		94		
dryophilus (Agaricus) Bulliard	470	17; 434			sp. nov.	F
dycmogalus (Agaricus) Bulliard	503	584		95	nom. superfl.	F
- E -						
eburneus (Agaricus) Bolton	524	118; 551, fig. 2		96		F
echinophila (Peziza) Bulliard	235	500, fig. 1			sp. nov.	F
edulis (Agaricus) Bulliard apud Ventenat	630	134; 514		97	nom. superfl.	
edulis (Boletus) Bulliard	322	60; 494		98	nom. superfl.	F
elastica (Helvella) Bulliard	299	242		99	nom. superfl.	F
elegans (Boletus) Ventenat	Index	46		100	nom. superfl.	
ellipsosperma (Variolaria) Bulliard	183	492, fig. 3			sp. nov.	
ephemeroides (Agaricus) Bulliard	403	582, fig. 1			sp. nov.	F
ephemerus (Agaricus) Bulliard	394	128; 542, fig. 1		101	nom. superfl.	F
epidendra (Peziza) Bulliard	246	467, fig. 3		102	nom. superfl.	
epidendrum (Lycoperdon) Linnaeus	145	503		103		
epiphyllus (Agaricus) Bulliard	543	569, fig. 2		104	nom. superfl.	
epixylon (Agaricus) Bulliard	382	581, fig. 2		105	nom. superfl.	
epixylon (Reticularia) Bulliard	90	472, fig. 1			sp. nov.	F*
ericeorum (Agaricus) Ventenat	Index	551, fig. 1		106	nom. superfl.	
ericeus (Agaricus) Bulliard & Ventenat	523	188; 551, fig. 1		107	nom. superfl.	
erinaceus (Hydnum) Bulliard	304	34			sp. nov.	F
esculentus (Phallus) Linnaeus	274	218		108		

excipuliforme (Lycoperdon) Ventenat	index	450, fig. 2	109	nom. superfl.	P
extinctorius (Agaricus) Linnaeus	408	437, fig. 2	110		
fastigiata (Clavaria) Ventenat	index	358, figs. D, E	111	nom. superfl.	
favus (Boletus) Linnaeus	363	421	112		
felleus (Boletus) Bulliard	325	379		sp. nov.	F
ferruginea (Auricularia) Bulliard	281	378	113	nom. superfl.	
ferruginea (Clavaria pistillaris var.) Bulliard	211	-----		var. nov.	
ferruginea (Peziza cyathoidea var.)	250	-----		var. nov.	
ferruginea (Peziza tremelloidea var.) Bulliard	240	410, fig. IA		var. nov.	
ferrugineus (Mucor) Bulliard	108	504, fig. 12	114	nom. superfl.	
fibula (Agaricus) Bulliard & Ventenat	534	186; 550, fig. 1		sp. nov.	F
ficcoides (Agaricus) Bulliard & Ventenat	526	587, fig. 1		sp. nov.	
ficcoides (Sphaerocarpus) Bulliard	130	417, fig. 3	115	nom. superfl.	F*
filiformis (Clavaria) Bulliard	205	448, fig. 1	116	nom. superfl.	F
filopes (Agaricus) Ventenat	index	320	117	sp. nov.	
fimbriatus (Agaricus) Bulliard	450	563, fig. 2	118	nom. superfl.	F
fimbriatus (Boletus) Bulliard	332	254		sp. nov.	
fimi-putris (Agaricus) Bulliard	430	66		sp. nov.	
fistulosa (Clavaria) Bulliard	213	463, fig. 2		sp. nov.	
fistulosus (Agaricus) Bulliard	454	320; 395; 518; 563, fig. 4	119	nom. superfl.	
floriformis (Sphaerocarpus) Bulliard	142	371		sp. nov.	
foraminulosus (Agaricus) Bulliard	460	403, figs. B, C; 535, fig. 1		sp. nov.	
fraxineus (Boletus) Bulliard	341	433, fig. 2		sp. nov.	F*
fragiformis (Sphaerocarpus) Bulliard	141	384		sp. nov.	
fructigena (Peziza) Bulliard	236	228	120	nom. superfl.	F
frumentaceus (Agaricus) Bulliard apud enat	602	571, fig. 1		sp. nov.	
fugax (Variolaria) Bulliard	187	432, fig. 5	121	nom. superfl.	F*
fuliginea (Auricularia reflexa var.) Bulliard	282	483, fig. III		var. nov.	

fuliginosa (Clavaria pistillaris var.) Bulliard	211	-----		var. nov.
fulva (Helvella crispa var.) Bulliard	293	190, figs. A, D, E		var. nov.
fulva (Helvella mitra var.) Bulliard	298	466		var. nov.
fulva (Helvella tubaeformis var.) Bulliard	294	208, figs. A, B; 461, figs. B, D		var. nov.
fulvus (Agaricus) Bulliard apud Ventenat	608	555, fig. 2; 574, fig. 1		sp. nov.
fulvus (Boletus suberosus var.) Bulliard	354	482, fig. A, B		var. nov.
furfuraceus (Agaricus) Bulliard apud Ventenat	621	532, fig. 1		sp. nov.
fusca (Auricularia caryophyllea var.) Bulliard	284	278		var. nov.
fusca (Auricularia reflexa var.) Bulliard	282	482, fig. II		var. nov.
fusca (Auricularia tremelloides var.) Bulliard	278	-----		var. nov.
fusca (Clavaria coriacea var.) Bulliard	198	452, fig. II		var. nov.
fusca (Helvella crispa var.) Bulliard	293	190, fig. B, C		var. nov.
fusca (Helvella elastica var.) Bulliard	299	242, fig. C		var. nov.
fusca (Helvella mitra var.) Bulliard	298	190, figs. D, E; 466, fig. B		var. nov.
fusca (Peziza labellum var.) Bulliard	262	204		var. nov.
fusca (Peziza stipitata var.) Bulliard	271	196, figs. A-C		var. nov.
fuscus (Phallus esculentus var.) Bulliard	274	218, figs. E, F, H		var. nov.
fusiformis (Agaricus) Ventenat	index	76		nom. superfl.
fusipes (Agaricus) Bulliard apud Ventenat	612	36; 106; 516, fig. 2	122 123	nom. superfl. F
gelatinosa (Helvella) Bulliard	- G - 296	473, fig. 2	124	nom. superfl.
gelatinosa (Peziza) Bulliard	239	460, fig. 2		sp. nov.
geophilus (Agaricus) Bulliard apud	546	522, fig. 2	283	sp. nov. F

geotropius (Agaricus) Bulliard & glabra (Nidularia laevis var.) Bulliard	521 165	400; 573, fig. 2 40, fig. C; 488, fig. 2	125	nom. superfl. var. nov.	
glandulosa (Tremella) Bulliard	220	420, fig. 1	126	nom. superfl.	F*
glandulosa (Tremella nigricans var.) Bulliard	217	455, figs. E, F	126	var. nov.	
glandulosus (Agaricus) Bulliard & Ventenat	388	426		sp. nov.	F
glaucus (Agaricus) Bulliard apud Ventenat	593	521, fig. 1		sp. nov.	
globulare (Hypoxylon) Bulliard	169	444, fig. 2	127	nom. superfl.	
globulifer (Sphaerocarpus) Bulliard	134	484, fig. 3		sp. nov.	
glomerulatum (Hypoxylon) Bulliard	178	468, fig. 3		sp. nov.	
glomerulosus (Mucor) Bulliard	101	504, fig. 3		sp. nov.	F*
glutinosus (Agaricus) Batsch	527	258; 539; 587, fig. 2	128		
gnaphaliocephalus (Agaricus) Bulliard & Ventenat	517	576, fig. 1		sp. nov.	
gossypium (Lycoperdon) Bulliard	147	435, fig. 1	287	sp. nov.	P
gossypinus (Agaricus) Bulliard	419	425, fig. 2		sp. nov.	F
grammocephalus (Agaricus) Bulliard apud Ventenat	616	594		sp. nov.	
grammopodius (Agaricus) Bulliard apud Ventenat	617	548; 585, fig. 1	129	nom. superfl.	F
granulata (Peziza) Bulliard	258	438, fig. 3		sp. nov.	F
granulosa (Clavaria) Bulliard	199	496, fig. 1	130	nom. superfl.	
granulosa (Tremella) Bulliard	227	499, fig. 2		sp. nov.	
granulosum (Hypoxylon) Bulliard	176	487, fig. 2		sp. nov.	
granulosus (Mucor) Bulliard	109	504, fig. 13		sp. nov.	
grymmopodius (Agaricus) Bulliard & Ventenat	531	601, fig. 1		sp. nov.	

- H -

hariolorum (Agaricus) Bulliard apud Ventenat	618	56; 585, fig. 2	sp. nov.	F
helvelloides (Agaricus) Bulliard & Ventenat	533	601, fig. 3	sp. nov.	
helveolus (Agaricus) Bulliard apud Ventenat	653	431; 531, fig. 1	sp. nov.	
hemisphaerica (Reticularia) Bulliard	93	446, fig. 1	sp. nov.	
hepaticus (Boletus) Ventenat	index	74	132 nom. superfl.	
hiemale (Lycoperdon) Ventenat	index	72	133 nom. superfl.	
hirtum (Lycoperdon) Ventenat	index	340	134 nom. superfl.	
hirtum (Lycoperdon proteus var.) Bulliard	149	340; 475, figs. A-D, F-I, M	var. nov.	P*
hirtus (Boletus) Ventenat	index	493	135 nom. superfl.	F*
hispidus (Boletus) Bulliard	351	210; 493	sp. nov.	
horizontalis (Agaricus) Bulliard apud Ventenat	573	324	sp. nov.	
hortensis (Reticularia) Bulliard	86	424, fig. 2	nom. superfl.	
hybrida (Clavaria) Bulliard	194	440, fig. 1	sp. nov.	
hybridum (Hydnum) Bulliard	307	453, fig. 2	nom. superfl.	
hybridus (Agaricus) Ventenat	index	398	137 nom. superfl.	
hydrogrammus (Agaricus) Bulliard & Ventenat	515	564	138 nom. superfl.	
hydrophilus (Agaricus) Bulliard	440	112; 511	sp. nov.	
hydrophorus (Agaricus) Bulliard	491	558, fig. 2	nom. superfl.	
hydrophorus (Peziza) Bulliard	243	410, fig. 2	sp. nov.	
hyemale (Lycoperdon proteus var.)	148	72; 475, fig. E	var. nov.	P*

- I -

ignarius (Boletus) Linnaeus	361	82; 454		
ileopodius (Agaricus) Bulliard apud Ventenat	656	578; 586, fig. 2; 592	sp. nov.	
imberbis (Peziza) Bulliard	339	445, fig. 1	sp. nov.	

imberbis (Peziza) Bulliard	245	467, fig. 2	142	nom. superfl.	F*
imbricatus (Boletus) Bulliard	349	366		sp. nov.	
impudicus (Phallus) Linnaeus	276	182	143		
infundibuliformis (Agaricus) Bulliard & Ventenat	510	286; 553	144	nom. superfl.	
inodorus (Agaricus) Bulliard apud Ventenat	552	524, fig. 2		sp. nov.	
ionides (Agaricus) Bulliard apud Ventenat	557	533, fig. 3		sp. nov.	F
- J -					
juglandis (Boletus) Schaeffer	344	19	145		
- L -					
labellum (Peziza) Bulliard	262	204	146	nom. superfl.	
labyrinthiformis (Agaricus) Bulliard & labyrinthiformis (Boletus) Bulliard	377	352; 442, fig. 1	147	nom. superfl.	
lacinata (Clavaria) Schaeffer	357	491, fig. 1		sp. nov.	
lacinata (Tremella) Bulliard	208	415, fig. 1	148		
lacrymbundus (Agaricus) Bulliard	226	499, fig. 1		sp. nov.	F
lactea (Peziza) Bulliard	438	194; 525, fig. 3	149	sp. nov.	
lacteus (Agaricus) Bulliard & Ventenat	253	376, fig. 3	150	nom. superfl.	
lactifluus acris (Agaricus) Ventenat	532	601, fig. 2	151	nom. illeg. & superfl.	
lactifluus dulcis (Agaricus) Ventenat	index	200	152	nom. illeg. & superfl.	
lactifluus-plumbeus (Agaricus) Ventenat	index	224	153	nom. superfl.	
lactifluus zonarius (Agaricus) Ventenat	index	282	154	nom. superfl.	
lacunosum (Lycoperdon) Ventenat	index	104	155	nom. superfl.	P*
lacunosum (Lycoperdon proteus var.) Bulliard	149	52		var. nov.	

laeve (Lycoperdon bovista var.) Bulliard	154	-----		var. nov.
laevis (Nidularia) Bulliard	165	488, fig. 2	154	nom. superfl.
laevi (Tremella nigricans var.) Bulliard	217	-----	157	var. nov.
lamprocephalus (Agaricus) Bulliard apud Ventenat	652	544, fig. 2	158	nom. superfl.
lanuginosa (Peziza) Bulliard	260	396, fig. 2	159	nom. superfl.
lanuginosus (Agaricus) Bulliard apud Ventenat	657	370	160	nom. superfl.
laricis (Boletus) Rubel in Jacquin	353	296	161	var. nov.
lateritia (Auricularia caryophyllaea var.) Bulliard	284	483, fig. VI		
lateritia (Peziza vesiculosa var.) Bulliard	270	557, figs. G, I		var. nov.
lenticularis (Peziza) Bulliard	248	300		sp. nov.
lentifera (Peziza) Ventenat	index	40	162	nom. superfl.
leucocephalus (Agaricus) Bulliard apud Ventenat	597	428, fig. 1; 536	163	nom. superfl.
leucopodia (Trichia) Bulliard	121	502, fig. 2		sp. nov.
leucopodius (Agaricus) Bulliard apud Ventenat	556	533, fig. 2		sp. nov.
lignatilis (Agaricus) Bulliard & Ventenat	528	554, fig. 1		sp. nov.
lignifragus (Mucor) Bulliard	103	504, fig. 6		sp. nov.
ligularis (Tremella) Bulliard	223	427, fig. 1		sp. nov.
lineatus (Agaricus) Bulliard apud Ventenat	547	522, fig. 3	164	nom. superfl.
livida (Tremella mesenteriformis var.) Bulliard	230	406, fig. Aa; 499, fig. T		var. nov.
lividus (Agaricus) Ventenat	index	382	165	nom. superfl.
lividus (Boletus) Bulliard	327	490, fig. 2		sp. nov.
loculiferum (Hypoxylon) Bulliard	174	495, fig. 1		sp. nov.
longipes (Agaricus) Bulliard apud Ventenat	613	232, 575		sp. nov.
lutea (Auricularia reflexa var.) Bulliard	281	278, figs. A-D		var. nov.

lutea (Clavaria coralloides var.) Bulliard Bulliard	201	222; 358, figs. B, D, E; 496 figs. O, Q	var. nov.
lutea (Clavaria cylindrica var.) Bulliard	212	463, fig. 1B, N, O	var. nov.
lutea (Helvella tubaeformis var.) Bulliard	294	461, figs. A, C	var. nov.
lutea (Peziza cyathoidea var.) Bulliard	250	416	var. nov.
lutea (Peziza fructigena var.) Bulliard	236	228, figs. A, B, E	var. nov.
lutea (Peziza stercoraria var.) Bulliard	256	376, fig. I	var. nov.
lutea (Reticularia) Bulliard	87	380, fig. I	nom. superfl.
lutea (Tremella cerebrina var.) Bulliard	221	386, fig. B	var. nov.
lutea (Tremella mesenteriformis var.)	230	406, figs. B, D; 499, Fig. VI, u, v	var. nov.
luteus (Boletus) Ventenat	index	4	nom. superfl.
luteus (Boletus hispidus var.) Bulliard	351	493, figs. A-D	var. nov.
luteus (Sphaerocarpus) Bulliard	136	407, fig. 2	sp. nov.
lycoperdon (Reticularia) Bulliard	95	446, fig. 4; 475, figs. 1-3	nom. superfl.
lycoperdonoides (Agaricus) Bulliard apud Ventenat	610	166; 516, fig. 1	nom. superfl.
melanospermus (Agaricus) Bulliard apud Ventenat	628	540, fig. 1	sp. nov.
melinoides (Agaricus) Bulliard	444	560, fig. 1	nom. superfl.
melogramma (Variolaria) Bulliard	182	492, fig. 1	sp. nov.
membranaceum (Hydnum) Bulliard	302	481, fig. 1	sp. nov.
mesenteriformis (Tremella) Jacquin	230	406; 499, fig. 6	171
mesomorphus (Agaricus) Bulliard	481	506, fig. 1	sp. nov.
micaceus (Agaricus) Bulliard	415	94, 346, 565	nom. superfl.
millaceum (Hypoxylon) Bulliard	170	444, fig. 3	sp. nov.

- M -

mitra (Helvella) Linnaeus	298	190; 466	173	F
molibdocephalus (Agaricus) Bulliard apud Ventenat	620	523	284	sp. nov.
mollis (Agaricus) Ventenat	index	38	174	nom. superfl.
momentaceus (Agaricus) Ventenat	index	128	175	nom. superfl.
moschatum (Tuber) St. Amans apud Bulliard	79	479	176	sp. nov.
mouceron (Agaricus) Bulliard apud Ventenat	580	142		sp. nov.
mucoroides (Tremella) Bulliard	228	499, fig. 4		sp. nov.
mucosus (Agaricus) Bulliard apud Ventenat	661	549; 596, fig. 2	177	nom. superfl.
murinaceus (Agaricus) Bulliard apud Ventenat	588	520		sp. nov.
muscigenus (Agaricus) Ventenat	index	288	178	nom. superfl. F*
muscoideus (Clavaria) Linnaeus	203	358 Fig. A	179	
- N -				
necator (Agaricus) Bulliard	489	14, 529, fig. 2	180	nom. superfl.
nigra (Clavaria coriacea var.) Bulliard	198	-----		var. nov.
nigra (Peziza) Bulliard	238	116; 460, fig. 1	181	nom. superfl.
nigra (Reticularia) Bulliard	88	380, fig. 2		sp. nov.
nigra (Tremella cerebrina var.) Bulliard	221	386, fig. C		var. nov.
nigricans (Tremella) Bulliard	217	455, fig. 1	182	nom. superfl. F*
nigrescens (Agaricus) Bulliard apud Ventenat	587	212; 579, fig. 2	183	sp. nov.
nigripes (Agaricus) Bulliard	476	344; 519, fig. 2	184	nom. superfl.
nigrum (Tuber) Ventenat	index	356	185	nom. superfl.
nitens (Agaricus) Bulliard	424	84; 566, fig. 4	186	nom. superfl.
nivea (Clavaria cylindrica var.) Bulliard	212	463, fig. 1A, L, M		var. nov.
nudus (Agaricus) Bulliard apud Ventenat	605	439	187	nom. superfl. F
nummularium (Hypoxylon) Bulliard	179	468, fig. 3		sp. nov. F*
nummularius (Boletus) Bulliard	335	124		sp. nov.

nutans (Trichia) Bulliard	122	502, fig. 3	sp. nov.
- 0 -			
obliquatus (Boletus) Bulliard	335	7; 459	188 nom. superfl.
ochraceus (Agaricus) Bulliard apud Ventenat	644	362, 530, fig. 3	189 nom. superfl.
odorosus (Agaricus) Bulliard apud Ventenat	567	176; 556, fig. 3	F sp. nov.
omphalooides (Peziza) Bulliard operculatum (Hypoxylon) Bulliard	264	485, fig. 1	F sp. nov.
ophioglossoides (Clavaria) Linnaeus orcella (Agaricus) Bulliard & Ventenat	177	468, fig. 2	F nom. superfl.
ostraceum (Hypoxylon) Bulliard	196	372	190
ovinus (Agaricus) Bulliard apud Ventenat	519	573, fig. 1; 591	F nom. superfl.
ovooides (Agaricus) Bulliard apud Ventenat	170	444, fig. 4	F sp. nov.
	592	580	F sp. nov.
	668	364	F sp. nov.
Ventenat			
ovoideum (Lycoperdon) Ventenat	index	435, fig. 2, 3	193 nom. superfl.
ovoideum (Lycoperdon proteus var.) Bulliard	148	435, fig. III; 475, figs. B-D, M-N	var. nov.
- P -			
palmatum (Agaricus) Ventenat	index	216	194 nom. superfl.
papillaris (Peziza) Bulliard	244	467, fig. 1	F nom. superfl.
papillionaceus (Agaricus) Bulliard	428	58; 561, fig. 2	F sp. nov.
papyrina (Auricularia) Bulliard	279	402	F sp. nov.
parasiticum (Tuber) Bulliard	81	456	F sp. nov.
parasiticum (Agaricus) Bulliard apud Ventenat	609	574, fig. 2	196 nom. superfl.
parasiticus (Boletus) Bulliard	317	451, fig. 1	F sp. nov.
pectinaceus (Agaricus) Bulliard apud Ventenat	599	509	197 nom. superfl.

pediculatum (Lycoperdon) Bulliard	161	471, fig. 2	198	sp. nov.	
pedunculatum (Lycoperdon) Linnaeus	161	294			
peltoporus (Boletus) Bulliard & Ventenat	365	501, fig. 2		sp. nov.	
pellospermus (Agaricus) Bulliard	426	561, fig. 1	199	nom. superfl.	F
pellucidus (Agaricus) Bulliard & Ventenat	536	550, fig. 2		sp. nov.	
penicillata (Clavaria) Bulliard	207	448, fig. 3		sp. nov.	F*
penicillatus (Mucor) Bulliard	107	504, fig. 11	200	nom. superfl.	
perpendicularis (Agaricus) Bulliard	469	422, fig. 2		sp. nov.	
persistens (Tremella) Bulliard	223	304		sp. nov.	
petalodes (Agaricus) Bulliard	391	226; 557, fig. 2	201	nom. superfl.	F
phalocephalus (Agaricus) Bulliard apud Ventenat	607	555, fig. 1	202	nom. superfl.	F
phalopodius (Agaricus) Bulliard apud Ventenat	622	532, fig. 2		sp. nov.	F
phalloides (Clavaria) Bulliard	214	463, fig. 3		sp. nov.	
phoeniceum (Hypoxylon) Bulliard	171	487, fig. 3	203	nom. superfl.	
phoeniceus (Agaricus) Bulliard apud phonospermus (Agaricus) Bulliard apud	647	598, fig. 1		sp. nov.	
	568	534; 547, fig. 1; 590	204	nom. superfl.	
phylacteris (Auricularia) Bulliard	286	436, fig. 2		sp. nov.	
physaloides (Agaricus) Bulliard	420	566, fig. 1		sp. nov.	
picaceus (Agaricus) Bulliard	407	206		sp. nov.	F
pigmaeus (Agaricus) Bulliard	437	525, fig. 2	205	sp. nov.	
pileolarius (Agaricus) Ventenat	index	400	206	nom. superfl.	
piluliformis (Agaricus) Ventenat	index	112	207	nom. superfl.	
pinguis (Peziza) Ventenat	index	396, fig. 1			
piperatus (Agaricus) Bulliard apud Ventenat	601	292	208	sp. nov.	
piperatus (Boletus) Bulliard	318	451, fig. 2	223	nom. superfl.	
pirlforme (Lycoperdon proteus var.) Bulliard	148	32; 340; 475, figs. B, D, M		var. nov.	
pistillaris (Clavaria) Linnaeus	211	244	209		
pleopodius (Agaricus) Bulliard apud Ventenat	566	556, fig. 2		sp. nov.	F

radicosus (Agaricus) Bulliard apud Ventenat	637	160	sp. nov.	F
ramealis (Agaricus) Bulliard & Ventenat	538	336	nom. superfl.	F
ramentaceus (Agaricus) Bulliard apud Ventenat	640	595, fig. 3	sp. nov.	F
ramosum (Hydnum) Bulliard	305	390	nom. superfl.	
ramosus (Agaricus) Bulliard apud Ventenat	591	102	sp. nov.	F
ramosus (Boletus) Bulliard	349	418	sp. nov.	
ramosus (Mucor) Bulliard	116	480, fig. 3	sp. nov.	F
rapulum (Peziza) Bulliard	265	485, fig. 2	sp. nov.	F
reflexa (Auricularia) Bulliard	281	274; 483, figs. 1-5	nom. superfl.	
repandum (Hydnum) Linnaeus	311	172		
repandus (Agaricus) Bulliard apud Ventenat	586	423, fig. 2; 579, fig. 1	sp. nov.	F
repens (Agaricus) Ventenat	index	90	nom. superfl.	F*
retiruga (Helvella) Bulliard	289	498, fig. 1	sp. nov.	F
rimosus (Agaricus) Withering	558	388; 599		
roseus (Agaricus) Bulliard	473	162; 507	nom. superfl.	F*
roseus (Mucor) Bulliard	102	504, fig. 4	sp. nov.	
rubeolarius (Boletus) Bulliard	326	100; 490, fig. 1	nom. superfl.	
ruber (Boletus hispidus var.) Bulliard	351	210	var. nov.	
rubra (Auricularia papyrina var.) Bulliard	280	-----	var. nov.	
rufida (Clavaria pistillaris var.) Bulliard	211	244, figs. A-F	var. nov.	
rugosa (Clavaria) Bulliard	206	448, fig. 2	nom. superfl.	F
rutilus (Boletus suberosus var.) Bulliard	354	482, figs. C-E, G	var. nov.	
salicinus (Boletus) Bulliard	340	433, fig. 1	sp. nov.	
sanguineus (Agaricus) Ventenat	index	42	nom. superfl.	F
scaber (Boletus) Bulliard	319	132; 489, fig. 1	nom. superfl.	F*
scabrosum (Hypoxylon) Bulliard	180	468, fig. 5	sp. nov.	
scutellata (Peziza) Linnaeus	247	10		

- S -

segetum (Reticularia) Bulliard	30	472, fig. 2	238	sp. nov.
semiorbicularis (Agaricus) Bulliard	467	422, fig. 1	239	nom. superfl.
semi-trichoides (Sphaerocarpus) Bulliard	125	387, fig. 1		nom. superfl.
sericeus (Agaricus) Bulliard apud Ventenat	576	413, fig. 2; 526		sp. nov.
sessilis (Agaricus) Bulliard	383	152; 581, fig. 3	240	nom. superfl.
sessilis (Sphaerocarpus) Bulliard	132	417, fig. 5		sp. nov.
sideroides (Agaricus) Bulliard apud Ventenat	574	588		sp. nov.
simplex (Variolaria) Bulliard	186	432, fig. 3	241	nom. superfl.
sinuosa (Reticularia) Bulliard	94	446, fig. 3		sp. nov.
solitarius (Agaricus) Bulliard apud Ventenat	675	48; 593		sp. nov.
sordide viridis (Tremella vesicaria var.)	224	-----		nom. illeg. (polynomial)
sphaerocephalus (Mucor) Bulliard	112	480, fig. 2	242	nom. superfl.
sphaeroidalis (Reticularia) Bulliard	94	446, fig. 2		sp. nov.
sphaerosperma (Variolaria) Bulliard	183	492, fig. 2		sp. nov.
sphaleromorphus (Agaricus) Bulliard apud Ventenat	629	540, fig. 2		sp. nov.
sphinctericum (Hypoxylon) Bulliard	168	444, fig. 1		sp. nov.
squamosum (Hydnum) Bulliard	310	409	243	nom. superfl.
squamosum (Lycoperdon aurantium var.) Bulliard	158	-----		var. nov.
squamosus (Agaricus) Bulliard apud Ventenat	625	266	244	nom. superfl.
squarrosus (Agaricus) Bulliard	463	535, fig. 3		sp. nov.
stellatum (Lycoperdon) Linnaeus	160	238; 471, fig. 1	245	
stercoraria (Peziza) Bulliard	256	376, fig. 1; 438, fig. 4		sp. nov.
stercorarius (Agaricus) Bulliard	398	68; 542, fig. 2	246	nom. superfl.
stipitata (Peziza) Bulliard	271	196; 457, fig. 2	247	nom. superfl.
stipitata (Reticularia) Bulliard	89	380, fig. 3		sp. nov.
striata (Nidularia) (Hoffmann) Bulliard	166	40	248	comb. nov., nom. superfl.

striatus (Agaricus) Bulliard	433	80; 552, fig. 2	249	nom. superfl.	F
stypticus (Agaricus) Bulliard & Ventenat	389	140; 557, fig. 1	250	nom. superfl.	F*
suaveolens (Boletus) Linnaeus	342	310	251		
subcaerulea (Auricularia tremelloides var.) Bulliard	278	-----		var. nov.	
suberosus (Boletus) Bulliard	354	482		sp. nov.	
subfuliginea (Peziza stercoraria var. lutea subvar.) Bulliard	256	376, fig. 1		subvar. nov.	
subiamellosum (Hydnum) Bulliard	306	453, fig. 1		sp. nov.	
sublanatum (Lycoperdon bovista var.)	154	-----		var. nov.	
sub-lateritic-fusca (Peziza vesiculosa var. Lateritia subvar.) Bulliard	270	557, fig. R		subvar. nov.	
subularis (Peziza) Bulliard	236	500, fig. 2		sp. nov.	F
sulphureus (Agaricus) Bulliard apud Ventenat	563	168; 545, fig. 2		sp. nov.	F
sulphureus (Boletus) Bulliard	347	429		sp. nov.	F*
- T -					
tentacula (Agaricus) Bulliard	447	560, fig. 3		sp. nov.	F
tesselatus (Agaricus) Bulliard apud Ventenat	583	513, fig. 1	285	sp. nov.	
theogalus (Agaricus) Bulliard & Ventenat	495	567, fig. 2	286	sp. nov.	F
tigrinus (Agaricus) Bulliard	508	38	252	nom. superfl.	F
titubans (Agaricus) Bulliard	417	425, fig. 1		sp. nov.	F
togularius (Agaricus) Bulliard apud Ventenat	639	595, fig. 2	253	nom. superfl.	F
tomentosa (Nidularia laevis var.) Bulliard	165	40, fig. B	254	var. nov.	
tomentosus (Agaricus) Bulliard	402	138		sp. nov.	
tremelloidea (Peziza) Bulliard	240	410, fig. 1	255	nom. superfl.	
tremelloides (Auricularia) Bulliard	278	290		sp. nov.	
trichoides (Sphaerocarpus) Bulliard	124	387, fig. 2	256	nom. superfl.	
tricolor (Agaricus) Bulliard	380	541, fig. 2		sp. nov.	
tubaeformis (Helvella) Bulliard	294	208; 461		sp. nov.	F*

tuberosa (Peziza) Bulliard	266	485, fig. 3	257	sp. nov.	F
tuberosus (Agaricus) Bulliard apud Ventenat	548	256; 522, fig. 4		nom. superfl.	F
tuberosus (Boletus) Ventenat	index	100	258	nom. superfl.	F
turbinatus (Agaricus) Bulliard apud Ventenat	645	110	259	nom. superfl.	F
tuberosus (Sphaerocarpus) Bulliard	132	484, fig. 1		sp. nov.	
typhoides (Agaricus) Bulliard	405	16; 582, fig. 2	260	nom. superfl.	
typhoides (Trichia) Bulliard	119	477, fig. 2		sp. nov.	
- U -					
ulmarius (Agaricus) Bulliard apud umbellatus (Mucor) Bulliard	582	510		sp. nov.	F*
umbilicatus (Agaricus) Bulliard	105	504, fig. 8		sp. nov.	
undulatus (Agaricus) Bulliard	466	411, fig. 2		sp. nov.	
undulatus (Agaricus) Bulliard	462	535, fig. 2		sp. nov.	
ungulatus (Boletus) Schaeffer	357	401; 491, fig. 2	261		
unicolor (Boletus) Bulliard	365	408; 501, fig. 3		sp. nov.	F*
urceolatus (Mucor) Dickson	111	480, fig. 1	262		
ureus (Agaricus) Bulliard apud Ventenat	577	528, fig. 1	263	nom. superfl.	
ustulata (Tremella) Bulliard	221	420, fig. 2		sp. nov.	
ustulatum (Hypoxylon) Bulliard	176	487, fig. 1	264	nom. superfl.	
utricularis (Sphaerocarpus) Bulliard	128	417, fig. 1		sp. nov.	P
utriforme (Lycoperdon) Bulliard	153	450, fig. 1		sp. nov.	
- V -					
vaginatus (Agaricus) Bulliard apud Ventenat	664	98; 512	265	nom. superfl.	F
ventricosus (Agaricus) Bulliard	465	411, fig. 1		sp. nov.	F
variegata (Auricularia reflexa var.) Bulliard	282	483, fig. VI, m		var. nov.	
verniciosa (Nidularia) Bulliard	164	488, fig. 1	266	nom. superfl.	P*
verrucosum (Lycoperdon) Bulliard	157	24		sp. nov.	

verrucosum (Lycoperdon aurantiacum var.) Bulliard	158	-----	267	var. nov.
verrucosus (Agaricus) Curtis	672	316	268	
vesicolor (Boletus) Ventenat	index	86	269	nom. superfl.
verticalis (Tremella) Ventenat	index	272	270	nom. superfl.
vesicularia (Tremella) Bulliard	224	427, fig. 3	271	sp. nov.
vesiculosa (Peziza) Bulliard	270	44, 457, fig. 1	272	nom. superfl. F
villosus (Agaricus) Bulliard apud Ventenat	572	214		sp. nov.
villosus (Mucor) Bulliard	110	504, fig. 15		sp. nov.
vinoso-subfusca (Trichia cinnabaris var.) Bulliard	121	502, fig. 1D	273	var. nov.
vinosus (Agaricus) Ventenat	index	54	274	nom. superfl.
violacea (Auricularia tremelloides var.) Bulliard	278	290		var. nov.
violacea (Peziza stercoraria var.) Bulliard	256	438, fig. IV		var. nov.
violacea (Peziza tremelloidea var.) Bulliard	240	410, fig. IB, C		var. nov.
violacea (Tremella mesenteriformis var.) Bulliard	230	272, fig. VI; 499		var. nov.
violaceus (Agaricus) Linnaeus	649	598, fig. 2	275	nom. superfl.
viridis (Peziza) Ventenat	index	376, fig. 4	276	sp. nov.
viridis (Sphaerocarpus) Bulliard	135	407, fig. 1		var. nov.
viridis (Peziza callosa var.) Bulliard	252	376, fig. IV		nom. superfl. F
volvaceus (Agaricus) Bulliard apud Ventenat	663	262; 330	277	nom. superfl.
volvaceus (Clathrus) Bulliard	190	441	278	nom. superfl.
volvaceus-minor (Agaricus) Ventenat	index	330	279	nom. superfl.

- X -

sp. nov.

642 530, fig. 2

xylophilus (Agaricus) Bulliard apud
Ventenat

- Z -		280	nom. superfl.
491	104		
zonarius (Agaricus) Bulliard			

Appendix

Notes On the Index

1. LSpPl: 1650.
2. New name for *Helvella agariciiformia* Bolton (Bolt: 98, fig. 1).
3. New name for *Agaricus piperatus* Linn. (LSpPl: 1641).
4. New name for *Agaricus campanulatus* Schaeffer (Sch 4: 28, pl. 63)
5. New name for *Agaricus fuliginatus* Batsch (BEF: 81)
6. New name for *Trichia sphaerocephala* Hoffmann (HV 2: 15, t. 4, fig. 2)
7. *Agaricus "alliatus"* Schaeffer (Sch 4: 43, pl. 99)
8. LSP: 1176. Also cited is Pauli, Joach. "Nom. Fung." I do not know this reference, and would appreciate information about it.
9. A new name used for the conglomerate of several Schaeffer species, including *A. pulverulentus*, *A. croceus*, *A. mutabilis*, *A. flavidus*, etc.
10. New name for *Clavaria purpurea* Schaeffer (Sch 4: 117, pl. 172) "*Amethystina*" of Fries (Fr 1: 472).
11. New name for *Elvela purpurea* Schaeffer (Sch 4: 114, pls. 323, 324)
12. New name for *A. rosellus* Batsch (BEFC 1: 121); the name probably was an adaptation of *A. amethystinus* Bolton (Bolt: 63).
13. New name for *A. obscurus* Schaeffer (Sch 4: 32, pl. 74; the name may have been an adaptation of *A. subannulatus* Batsch (BEFC 1: 75).
14. New name for *B. luteus* Linnaeus (LSP: 1177), attributed to Schaeffer (Sch 4: 81).
15. A name substitution by Ventenat for *A. dryophilus* q.v.
16. *Agaricus araneosus* was used by Bulliard, but Ventenat did not recognize the name. In its place were the following:

Page	Plate	Name
648	96	<i>A. dasypodius</i> , q.v.
649	250; 598, fig. 2	<i>A. violaceus</i> , q.v.
659	600	<i>A. proteus</i> , q.v.
653	431	<i>A. helveolus</i> , q.v.
index (698)	-----	----

17. The text lists only *A. violaceus* (q.v.), while the index lists both *A. araneosus* and *A. araneosus-violaceus*.
18. New name for *L. arrhizon* Batsch (BEFC 1: 239)
19. New name for *Tremella nostoc* Hoffmann (HV 1: 41; "nostos" of index).
20. LSP: 1175.
21. Ventenat's name for *Peziza scutellata*, q.v.
22. New name for *Agaricus caesareus* Scopoli (Scop: 419), attributed by Bulliard to Schaeffer (Sch 4: 64, 69).
23. LSP: 1184.

24. Ventenat's name for *Agaricus annularius*, q.v.
25. New name for *Tremella auricula* Linnaeus (LSpP1: 1625).
26. Ventenat's name for *Tremella auricula-judae*, q.v.
27. New name for *Tremella auricula* Linnaeus (LSpP1: 1625), but note that Linnaeus's name also appears as a synonym of *Auricularia auricula-judae*, q.v.
28. LSP: 1178
29. New name for *Embolus lactea* Hoffmann (HV 2: 8).
Jacquin is also given as author, but the name is not to be found in WJ 1: 137, as directed by Bulliard.
30. Ventenat's name for *Agaricus pectinaceus*, q.v.
31. New name for *Clavaria lutea* Bergeret (Berg 1: t. 167), an earlier homonym of *C. lutea* Vittadini.
32. LSP: 1183.
33. New name for *Boletus hepaticus* Schaeffer (Sch 4: 82, pls. 116-120).
34. Sch 4: 21, pl. 241.
35. New name for *Clavaria puccinia* Batsch (BEF: 139).
36. New name for aggregate of *L. gemmatum* Schaeffer (Sch 4: 130, pl. 189) and *L. echinatum* Schaeffer (Sch 4: 128, pl. 186).
37. New name for the aggregate of Batsch's *P. schenkii* (dubious; BEF: 125), *P. grisea* (BEF: 117) and *P. olivacea* (BEF: 127).
38. New name for *A. dentatus* Linnaeus (LSP: 1172).
39. LSP: 1175; LSpP1: 1643. Fries adopted Bulliard's name as separate from Linnaeus's.
40. New name for the aggregate of *A. lactifluus* Linnaeus (LSP: 1172, attributed to Schaeffer) *A. rubescens* Scopoli (Scop: 451, attributed to Schaeffer) and *A. fuscus* Schaeffer (Sch 4: 58, pl. 235).
41. New name for *Agaricus incurvus* Schaeffer (Sch 4: 29, pl. 65).
42. LSP: 1171; LSpP1: 1639.
43. New name for *Lycoperdon cinereum* Batsch (BEF: 155; BEFC 1: 249).
44. New combination of *Elvela caryophyllea* Schaeffer (Sch 4: 115, pl. 325).
45. Ventenat's new name for part of *L. proteus*, q.v.
46. Ventenat's name for part of *P. vesiculosa*, q.v.
47. New name for *Elvela mesenterica* Schaeffer (Sch 4: 108, pl. 168)
48. New name for the aggregate of Schaeffer's *B. cupreus* (Sch 4: 86, pl. 133) and *B. reticulatus* (Sch 4: 78, pl. 108). "Chrysenterus" of Fries (Fr 1: 126).
49. Ventenat's name for *Tremella mesenteriformis*, q.v.
50. Ventenat's new combination of *Mucor chrysospermus*, q.v.
51. New name for *Mucor granulatus* Schaeffer (Sch 4: 133, pl. 196).
52. "celiata" of index.
53. New name for *H. suberosum* Batsch (BEF: 113).
54. Ventenat's name for *Agaricus stercorarius*, q.v.
55. New name for *Clathrus denudatus* Linnaeus (LSP: 1179).
56. New combination of *Sphaeria cirrata* Hoffmann (HV 1: 27),
57. LSP: 1175. Fries accepted Bulliard's name as separate from Linnaeus's.

58. JFA 2; Sch 4: 100.
59. Sch 4: 70, pl. 302.
60. New name for *Trichia graniformis* Hoffman (HV 2: 3).
61. New combination for *Elvela cochleata* Wulfen in Jacquin (WJ 2: 112).
62. New name for *A. procerus* Scopoli (Scop: 418), attributed to Schaeffer (Sch 4: 12). *Agaricus clypeatus* Linnaeus (LSP: 1174) is listed as a doubtful synonym.
63. New name for *A. purpureus* Bolton (Bolt: 41, pl. 41B).
64. Ventenat's name for part of *Boletus chrysenteron*, q.v.
65. Ventenat's name for *Agaricus dimidiatus*, q.v.
66. Ventenat's name for *Agaricus micaceus*, q.v. A withering name, but not so cited by Ventenat.
67. New name for *Agaricus campanulatus* Schaeffer (Sch 4: 28, pl. 63).
68. New name for three prior names, the oldest of which is *Agaricus lateralis* Schaeffer (Sch 4: 31, pls. 71, 72).
69. Ventenat's name for *Agaricus fusipes*, q.v.
70. LSP: 1182; LSpPl: 1652.
71. Ventenat's name for *Clavaria cinerea*, q.v.
72. New name for the aggregate of *Agaricus quercinus* Linn. (LSP: 1176) and *Boletus versicolor* Linn. (LSP: 1176).
73. Scop: 465, attributed to Schaeffer (Sch 4: 84).
74. Ventenat's name for *Helvella tubaeformis*, q.v.
75. New combination for *Peziza cornucopioides* Linn. (LSP: 1181).
76. A return by Ventenat to the basionym of *Helvella cornucopioides*, q.v.
77. New name for *Clavaria hypoxylon* Linn. (LSP: 1182), attributed to Bergeret.
78. New name for *Peziza inflecta* Bolton (Bolt: 106, pl. 106, fig. 2).
79. "coronillus" of index. New name for *Agaricus horizontalis* Pauli.
80. New name for *Peziza cupularis* Linnaeus (LSP: 1181) and *P. serrata* Hoffmann (HV 2: 26).
81. New name for *Elvela floriformes* Schaeffer (Sch 4: 110; pl. 278).
82. New name for *Agaricus conicus* Scopoli (Scop: 443), attributed to Schaeffer (Sch 4: 2).
83. New name for *Agaricus lateritius* Batsch (BEF: 41). *Agaricus punctatus* Schaeffer (Sch 4: 19) is listed as a doubtful synonym.
84. Bolt: 143, pl. 143.
85. Sch 4: 93, pl. 139. Fries accepted Bulliard's name as separate from Schaeffer's.
86. New name for *Agaricus umbilicatus* Scopoli (Scop: 431), attributed to Schaeffer (Sch 4: 46).
87. Ventenat's name for *Agaricus coriaceus*, q.v.
88. New name for *Peziza calyculus* Batsch (BEF: 123). "Cyathoidea" of Fries (Fr 2: 124).
89. New name for *Clavaria pistillaris* Linnaeus (LSP: 1182, LSpPl: 1651).
90. New name for *Agaricus varius* Schaeffer (Sch 4: 20, pl. 42).

91. New name for several prior names, the oldest of which is *Agaricus lacer* Schaeffer (Sch 4: 68, pl. 257).
92. New name for the aggregate of *A. minutulus* Schaeffer (Sch 4: 72, pl. 308) and *A. umbelliferus* Linnaeus (LSP: 1175), attributed to Schaeffer.
93. LSP: 1182; LSpPl: 1652.
94. Sch 4: 57, pl. 233. Also cited is Jacquin (JFA 2: 3, pl. 104), but this leads to *Agaricus ostreatus*.
95. New name for *Agaricus ichoratus* Batsch (BEFC 1: 37).
96. Fries accepted Bulliard's name as separate from Bolton's.
97. New name for *Agaricus campestris* Linnaeus (LSP: 1173; LSpPl: 1641).
98. New name for three old names, the oldest of which is *Boletus bovinus* Linnaeus (LSP: 1177; LSpPl: 1646).
99. New name for *Elvela fuliginosa* Schaeffer (Sch 4: 113, pl. 320).
100. Ventenat's name for *Boletus calceolus*, q.v.
101. New name for *Agaricus radiatus* Bolton (Bolt: 39, pl. 39C).
102. New name for *Peziza coccinea* Bolton (Bolt: 104, pl. 104, figs. A-C).
103. LSP: 1184; LSpPl: 1654.
104. New name for *Agaricus umbelliferus* Linnaeus (LSP: 1175), and *A. clavus* Linnaeus (LSP: 1175).
105. New name for *Agaricus applicatus* Batsch (BEFC 1: 171).
106. Ventenat's name for *Agaricus ericeus*, q.v.
107. New name for aggregate of *A. niveus* Scopoli (Scop: 430), attributed to Schaeffer, and *A. clavaeformis* Schaeffer (Sch 4: 72, pl. 307).
108. LSP: 1178; LSpPl: 1648.
109. Ventenat's name for *Lycoperdon proteus*, q.v. Persoon cites the author as Scopoli, but Ventenat gives no credit.
110. LSP: 1174; LSpPl: 1643, listed as doubtful.
111. Ventenat's name for *Clavaria coralloides*, q.v.
112. LSpPl: 1645.
113. New name for *Boletus auriformis* Bolton (Bolt: 82, pl. 82).
114. New name for *Mucor erysiphe* Linnaeus (LSP: 1186; LSpPl: 1676).
115. New name for *Lycoperdon fragile* Dickson (Dick 1: t. III, fig. 5); listed as doubtful.
116. New name for *Clavaria gyrans* Bolton (Bolt: 112, pl. 112, fig. 1).
117. Ventenat's name for *Agaricus fistulosus*, q.v.
118. New name for *Boletus subtomentosus* Bolton (Bolt: 87, pl. 87).
119. New name for several older names, the oldest of which is *A. alliaceus* Jacquin (JFA 1: 52), and several of Schaeffer.
120. New name for *Peziza carpini* Batsch (BEFC 1: 217).
121. New name for *Sphaeria pustulata* Hoffmann (HV 1: 26).
122. Ventenat's name for *Agaricus fusipes*, q.v.
123. New name for aggregate of *A. crassipes* Schaeffer (Sch 4: 38) and *A. oedematopus* Schaeffer (Sch 4: 69).
124. New name for *Helvella lutea* Bergeret (Berg. I: 151).

125. New name for *Agaricus mollis* Bolton (Bolt: 40);
A. albellus Schaeffer is also listed as doubtful.
126. New name for *Tremella arborea* Hoffmann (HV 1: 37).
127. Bulliard himself questioned the rank of this taxon,
so the name is dubious.
128. New name for *Sphaeria bombardica* Bolton (Bolt: 122).
129. BEFC 1: 61 (non Curtis).
130. New name for *Agaricus placenta* Batsch (BEF: 79);
A. cervinus Pauli is also listed, but I do not know
its date.
131. "Glanulosa" of index; new name for *Clavaria militaris*
Linnaeus (LSP: 1182; LSpPl: 1652).
132. Ventenat's name for *Fistulina buglossoides*, q.v.
133. Ventenat's name for *Lycoperdon proteus*, p.p., q.v.
134. Ventenat's name for *Lycoperdon proteus*, p.p., q.v.
135. Ventenat's name for *Boletus hispidus*, q.v.
136. New name for *Mucor septicus* Linnaeus (LSpPl: 1656).
137. New name for *Hydnum floriforme* Schaeffer (Sch 4: 97)
H. striatum Schaeffer (Sch 4: 98).
138. Ventenat's name for *Agaricus amarus*, q.v.
139. New name for *Agaricus collinus* Scopoli (Scop: 432),
attributed to Schaeffer, and for two Schaeffer
species.
140. LSP: 1176; LSpPlL 645.
141. Ventenat apparently thought of the fungi depicted
in these plates as three separate taxa, but
questioned his own judgement.
142. New name for *Peziza nivea* Batsch (BEF: 117).
143. LSP: 1179; LSpPl: 1648.
144. New name for *Agaricus fimbriatus* Bolton (Bolt: 61);
listed also are names by Batsch (1789, and therefore
a year after Bolton's) and Dickson.
145. Sch 4: 75, as "iuglandis."
146. New name for *Elvela albida* Schaeffer (Sch 4: 101).
147. New name for *Agaricus dubius* Schaeffer (Sch 4: 56).
148. Sch 4: 122.
149. New name for *Peziza nivea* Batsch (BEF: 117).
150. New name for aggregate of *A. saccharinus* Batsch (BEFC
1: 93) and *A. squamula* Batsch (BEFC 1: 95).
151. Trinomial, illegitimate: Ventenat's name for
A. acris, q.v.
152. Trinomial, illegitimate: Ventenat's name for
A. camphoratus, q.v.
153. Ventenat's name for *A. plumbeus*, q.v.
154. Trinomial, illegitimate: Ventenat's name for
A. zonarius, q.v.
155. Ventenat's name for *Lycoperdon proteus*, *pro parte*, q.v.
156. New name for *Peziza crucibuliformis* Scopoli (Scop: 486),
attributed to Schaeffer.
157. Nomen illegitimum.
158. New name for *Agaricus cinnamomeus* Linnaeus (LSP: 1173).
159. New name for *Elvela ochracea* Schaeffer (Sch 4: 103,
pl. 155).
160. New name for *Agaricus hispidus* Batsch (BEF: 81).
161. "Larycis" of index; Rubel in Jacquin, *Ed. Misc. Austr.*
1: 172.

162. Ventenat's name for *Nidularia striata*, q.v., but not attributed to Linnaeus.
163. New name for *Agaricus albus* Schaeffer (Sch 4: 68, pl. 256).
164. New name for *Agaricus tintinnabulum* Batsch (BEF: 67).
165. Ventenat's name for *Agaricus phonospermus*, q.v.
166. New name for *Mucro septicus* Bolton (Bolt: 134).
167. New name for aggregate of Schaeffer's *B. reticulatus* (Sch 4: 78) and *B. cupreus* (Sch: 4: 86); "luteus" not attributed to Linnaeus.
168. New name for *Mucor lycogalus* Bolton (Bolt: 133, pl. 133a).
169. New name for *Elvela clavata* Schaeffer (Sch 4: 100), cited by Bulliard as *Elvela "clavus."*
170. New name for the aggregate of Schaeffer's *A. acicula* (Sch 4: 52), *A. pyramidatus* (Sch 4: 56), and *A. griseus* (Sch 4: 236).
171. Jacquin in Jacquin, Ed. Miscell. Austr. 1: 142; also *Elvela meenterica* Schaeffer (Sch 4: 108).
172. New name for the aggregate of Scopoli's *A. truncorum* (Scop: 426) and *A. lignorum* (Scop: 427), both attributed to Schaeffer. Also cited are Schaeffer's *A. fuscescens* and *A. spadiceogriseus*.
173. LSP: 1180, as *Elvela*.
174. Ventenat's name for *Agaricus tigrinus*, q.v.
175. Ventenat's name for *Agaricus ephemerus*, q.v.
176. Bulliard reported that St. Amans was disinterested in his discovery and passed it on to Bulliard.
177. New name for the aggregate of Schaeffer's *A. glutinosus* (Sch 4: 17) and *A. limacinus* (Sch 4: 74).
178. Ventenat's name for *Helvella dimidiata*, q.v.
179. LSP: 1183.
180. New name for Scopoli's *Agaricus scrobiculatus* (Scop: 450), attributed to Schaeffer. Also cited are Schaeffer's *A. tomentosus* and *A. crinitus*.
181. New name for the aggregate of Schaeffer's *Elvela inflata* (Sch 4: 102) and *E. pulla* (Sch 4: 104).
182. New name for *Tremella purpurea* Hoffmann (HV: 28).
183. "Nigricans" of index.
184. New name for *Agaricus sphynx* Batsch (BEFC 1: 145).
185. Ventenat's name for *Tuber cibarium*, q.v.
186. New name for *Agaricus semi-globatus* Batsch (BEFC 1: 141). The species appears as *A. "niteus"* of index.
187. New name for *Agaricus bulbosus* Bolton (Bolt: 147).
188. New name for *Agaricus pseudo-boletus* Jacquin (JFA 1: 26, pl. 41).
189. New name for *Agaricus flavo-floccosus* Batsch (BEFC 1: 117).
190. New name for *Sphaeria stigma* Hoffmann (HV 1: 7, pl. II, fig. 2).
191. LSP: 1182; LSpPl: 1652.
192. New name for *Agaricus neptuneus* Batsch (BEFC 1: 161).
193. Ventenat's name for *Lycoperdon proteus*, *pro parte*, q.v.
194. Ventenat's name for *Agaricus ulmarius*, q.v.
195. New name for *Peziza cinerea* Batsch (BEFC 1: 197, but listed as doubtful).
196. New name for *Agaricus amanitae* Batsch (BEFC 1: 109, pl. 18).

197. New name for several previously named taxonomic concepts, the oldest of which is *Agaricus integer* Linnaeus (LSP: 1171).
198. LSP: 1184; LSpPl: 1654.
199. New name for *Agaricus helvolus* Schaeffer (Sch 4: 48, pl. 210).
200. New name for *Mucor caespitosus* Bolton (Bolt: 132, pl. 132, fig. 2).
201. New name for *Agaricus tremulus* Schaeffer (Sch 4: 53, pl. 224, but listed as doubtful). "Petaloides" of Fries (Fr 1: 184).
202. New name for *Agaricus cervinus* Schaeffer (Sch 4: 6, pl. 10).
203. New name for *Sphaeria sanguinea* Bolton (Bolt: 131, pl. 131, fig. 1).
204. New name for *Agaricus atricapillus* Batsch (BEFC 1: 77).
205. "Pygmeus" of index.
206. Ventenat's name for *Agaricus geotropius*, q.v.
207. Ventenat's name for *Agaricus hydrophilus*, q.v.
208. Not to be confused with *A. piperatus* under *A. acris*.
209. LSP: 1182; LSpPl: 1651.
210. Ventenat's name for *Agaricus striatus*, q.v.
211. Ventenat's name for *Agaricus fistulosus*, q.v.
212. Ventenat's name for *Boletus juglandis*, q.v.
213. New name for the aggregate of Schaeffer's *Agaricus armeniacus* (Sch 4: 35) and *A. incertus* (Sch 4: 28).
214. New name for *Lycoperdon bovista* Linnaeus (LSP: 1183), as well as several Schaeffer taxa.
215. New name for *Agaricus ericetorum* Persoon (POM 1: 50).
216. New name for *Agaricus muscarius* Linnaeus (LSP: 1172).
217. New name for *Agaricus oreades* Bolton (Bolt: 151).
218. Ventenat's name for *Agaricus amarus*, q.v.
219. LSP: 1180; LSpPl: 1650.
220. New name for the aggregate of Hoffmann's *Sphaeria disciformis* (HV 1: 15) and *S. bullata* (HV 1: 5, listed as doubtful).
221. LSpPl: 1625.
222. Ventenat's name for *Lycoperdon proteus*, *pro parte*, q.v. Persoon attributes the name to Willdenow and Schaeffer, but Ventenat gives no such indication.
223. New name for *Boletus feruginatus* Batsch (BEFC 1: 179).
224. New name for *Agaricus subhepaticus* Batsch (BEFC 2: 77).
225. New name for *Mucor botrytis* Bolton (Bolt: 132, pl. 132, fig. 2).
226. New name for *Agaricus candidus* Bolton (Bolt: 39).
227. New name for *Hydnium coralloides* Scopoli (Scop: 472), attributed to Schaeffer.
228. New name for *Boletus auriformis* Bolton (Bolt: 82, pl. 82).
229. LSP: 1178; LSpPl: 1647.
230. Ventenat's name for *Agaricus dryophilus*, q.v.
231. This name is attributed to Withering (British Plants), but I have not seen the reference. Fries attributed the name to Bulliard.
232. New name for *Agaricus icanthinus* Batsch (BEF: 79); also listed is *A. rubens* Bolton.

233. New name for the aggregate of Schaeffer's *Boletus olivaceus* (Sch 4: 77, pl. 105) and *B. luridus* (Sch 4: 78, pl. 107).
234. New name for *Clavaria elegans* Bolton (Bolt: 115, pl. 115).
235. Ventenat's name for *Agaricus pectinaceus*, q.v.
236. New name for *Boletus rufus* Schaeffer (Sch 4: 75, pl. 103).
237. LSP: 1181; LSpPl: 1651.
238. New name for the aggregate of Schaeffer's *Agaricus melleus* (Sch 4: 20, pl. 45), and *A. pusillus* (Sch 4: 45, pl. 203).
239. New name for *Trichia rufa* Hoffmann (HV 2: 10, as doubtful).
240. New name for Jacquin's *Agaricus niveus* (JFA 3: 48, pl. 288); also listed are *A. depluens* Batsch and *A. flabellatus* Bolton.
241. New name for *Sphaeria mammiformis* Hoffmann (HV 1: 13, pl. 3, fig. 2).
242. New name for *Mucor mucedo* Linnaeus (LSP: 1185).
243. New name for *Hydnium imbricatum* Linnaeus (LSP: 1178).
244. New name for the aggregate of Schaeffer's *A. floccosus* (Sch 4: 27) and *A. pilosus* (Sch 4: 34, pl. 80).
245. LSP: 1184; LSpPl: 1653.
246. A new name for several older named concepts, the oldest of which (but listed as doubtful) is *Agaricus fimetarius* Linnaeus (LSP: 1174). Others listed are Schaeffer's *A. cinereus* (Sch 4: 43, pl. 100), *A. rufocandidus* (Sch 4: 44, pl. 201) and *A. margaritaceus* (Sch 4: 50, pl. 216).
247. New name for the aggregate of Schaeffer's *Elvela hypocrateriformis* (Sch 4: 102, pl. 152) and *E. hispida* (Sch 4: 108, pl. 167).
248. New combination of *Cyathus striata* Hoffmann (HV 2: 33, pl. 8, fig. 3). An older name also listed, however, is *Peziza lentifera* Linnaeus (LSP: 1180). Cf. note 266.
249. New name for *Agaricus plicatus* Schaeffer (Sch 4: 15, pl. 31, as doubtful).
250. New name for *Agaricus semipetiolatus* Schaeffer (Sch 4: 47, pl. 208, as doubtful). "Stipticus" of Fries (Fr 1: 188).
251. LSP: 1177; LSpPl: 1646.
252. New name for *Agaricus atro-squamosus* Batsch (BEF: 81, pl. 6, fig. 27).
253. New name for the aggregate of Schaeffer's *Agaricus cereolus* (Sch 4: 22, pl. 51) and *A. candicans* (Sch 4: 50, pl. 217, as doubtful).
254. The name appears without a description, and is therefore a *nomen nudum*.
255. New name for *Lichen sarcoides* Jacquin (in Misc. Austriaca II: 378, pl. 22, as doubtful). The oldest name listed without doubt is *Peziza porphyrea* Batsch (BEF: 127).
256. New name for *Mucor cancellatus* Batsch (BEFC 2: 135). Two polynomial varieties are also listed.
257. New name for *Agaricus alumnus* Bolton (Bolt: 155).

258. Ventenat's name for *Boletus rubeolaris*, pro parte, q.v.
259. New name for *Agaricus sericeus* Schaeffer (Sch 4: 12, pl. 24).
260. New name for *Agaricus ovatus* Scopoli (Scop: 425), attributed to Schaeffer. Also listed are *A. cylindricus* (Sch 4: 5, pl. 8) and *A. porcellaneus* (Sch 4: 21, pls. 46, 47).
261. Sch 4: 88, pls. 137, 138.
262. Dick 1: 25.
263. New name for *Agaricus senescens* Batsch (BEFC 2: 35, pl. 32, fig. 187, as doubtful).
264. New name for *Sphaeria deusta* Hoffmann (HV 1: 3, pl. 1, fig. 2).
265. New name for *Agaricus plumbeus* Schaeffer (Sch 4: 37, pls. 85, 86) without doubt. Also listed as doubtful are *A. fulvus* (Sch 4: 41, pl. 95), *A. hyalinus* (Sch 4: 63, pl. 244) and *A. badius* (Sch 4: 63, pl. 245).
266. New name for *Peziza lentifera* Linnaeus (LSP: 1180). Note also that this name is listed as synonymous with *Nidularia striata*, q.v.
267. This name is listed without description, and is therefore a *nomen nudum*.
268. CFL 5: pl. 312 + text.
269. Ventenat's name for *Agaricus coriaceus*, q.v.
270. Ventenat's name for *Tremella mesenteriformis*, q.v.
271. "Vessicaria" of index.
272. New name for *Peziza cochleata* Linnaeus (LSP: 1181), attributed to Bolton.
273. Name listed without description, and therefore, a *nomen nudum*.
274. Ventenat's name for *Agaricus contiguus*, q.v.
275. LSP: 1173.
276. Ventenat's name for *Peziza callosa*, q.v.
277. New name for *Agaricus pulvinatus* Bolton (Bolt: 49).
278. New name for *Clathrus cancellatus* Linnaeus (LSP: 1179).
279. Ventenat's name for *Agaricus volvaceus*, q.v.
280. New name for *Agaricus fuscus* Schaeffer (Sch 4: 58, pl. 235, figs. 2, 3, 6, as doubtful).
281. "Haematospermus" of Fries (Fr 1: 282).
282. "Cartilagineus" of Fries (Fr 1: 46).
283. "Geophyllus" of Fries (Fr 1: 258).
284. "Molybdinus" of Fries (Fr 1: 49).
285. "Tessulatus" of Fries (Fr 1: 186).
286. "Thejogalus" of Fries (Fr 1: 71).
287. "Gossypinum" of Index and of Persoon (PS: 150)

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MYCOTAXON

Vol. VI, No. 1, pp. 167-172

July-September 1977

GILLETIELLA CHUSQUEAE AND ANTENNULARIA CHUSQUEAE

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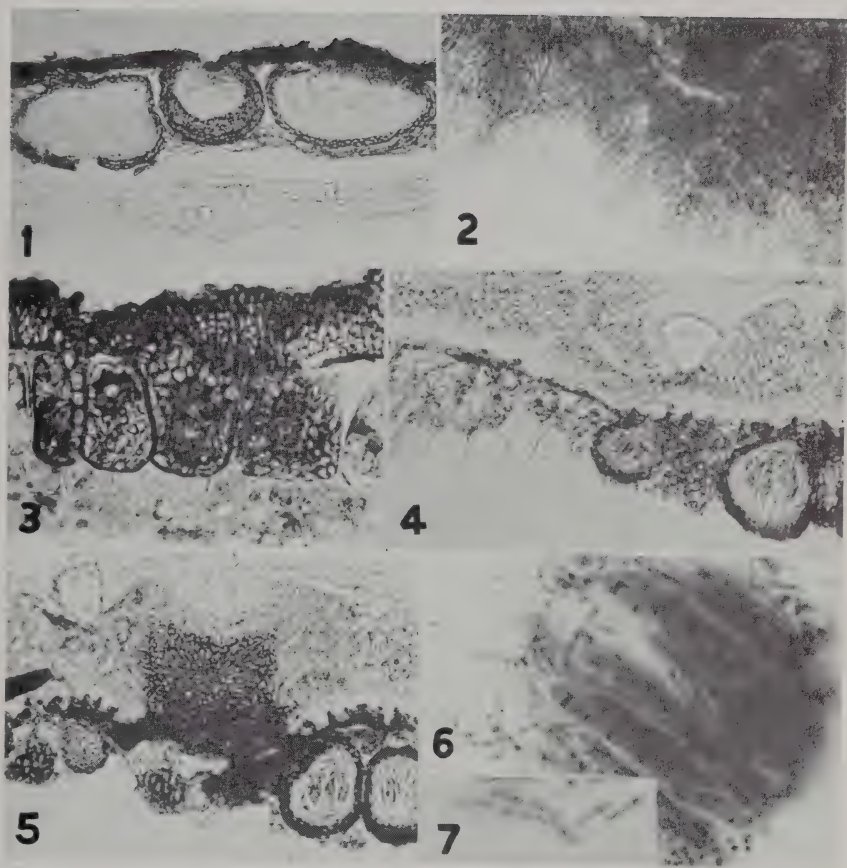
In an earlier paper (Farr, 1966) *Antennularia chusqueae* (Rehm) Farr was shown to consist of a perfect state variously described by earlier authors as *Asteridium chusqueae* Rehm, *Dimerina negeriana* (Henn.) Theissen, and *D. allogena* Sydow, an imperfect state (*Isaria acaricida* Pat.), and a hypostroma. The genus *Antennularia* Reichenb. is currently recognized and classified in the Stigmatiaceae Theissen by Arx & Müller (1975). These authors, in the same publication, indicate that *A. chusqueae* is identical with *Gilletiella chusqueae* (Pat.) Sacc. & Sydow.

A reexamination of *Antennularia chusqueae* and comparison with the type and another collection (Sydow Fgi. Exot. Exs. 1202) of *Gilletiella chusqueae* shows that these taxa represent two distinct fungi. Although superficially they appear similar, these fungi differ as follows: The mycelium of the *Gilletiella* is compacted into a flat, shield-shaped crust under which the ascocarps are located, so that the latter are not visible from above - only in sectioned material (FIG. 1). Toward the periphery the stroma consists of closely packed, radially oriented hyphae usually paler at the extremities (FIG. 2). Through a hand lens a colony of this fungus appears as a flat, compact crust slightly raised above the ascomata or locules, with a smooth, sometimes paler margin. Patouillard (in Patouillard & Lagerheim, 1895) and Hansford (1946, in key) considered *G. chusqueae* as microthyriaceous. Theissen & Sydow (1915) present a concise description and illustrations. Patouillard's original diagnosis (Patouillard & Lagerheim, 1895) mentions simple, ovoid "stylospores", and Arx & Müller

(1975) list an *Ascochyta* state; neither Theissen & Sydow (1915) nor Sydow (1939) refer to any imperfect state and I also did not notice any. The hypostroma is relatively shallow and effuse, well-developed only in the upper epidermis (FIG. 3).

In *Antennularia chusqueae* the ascocarps are superficial on a subiculum (FIGS. 4, 5) which consists of hyphae similar to those of *Gilletiella chusqueae* but partly fascicled in strands and elsewhere irregularly interwoven. The colonies thus appear rather "ragged" with frayed margins, and with the centrally located groups of fruiting bodies distinctly visible from above. In well-developed material of the two fungi these structural differences are plainly discernible under low magnifications. On some colonies and microscope slides of the *Antennularia*, the conidial (*Isaria*) apparatus is clearly evident (FIG. 4). The hypostroma forms a central column, penetrating deeply into the mesophyll (FIG. 5). For additional detailed illustrations of *A. chusqueae* see Farr, 1966, FIGS. 1-10.

The fruiting bodies, asci, and ascospores of the *Gilletiella* are larger than those of the *Antennularia* (TABLE 1). The asci are abundantly mixed with sterile filaments (?pseudoparaphyses), while those of the *Antennularia* appear to be paraphysate, at least at maturity. Sydow (1939) described the spores of the *Gilletiella* as having one septum and often "a delicate partition of the contents of each half, which may be interpreted as a rudimentary septum" [translation from the German]. Actually the ascospores of both fungi have at one time or another been depicted as two- to four-celled (Rehm, 1896; Arx & Müller, 1975). Young spores of the *Antennularia* frequently are four-guttulate, but in the *Gilletiella* even apparently ripe, free spores sometimes appear distinctly four-celled under the 40X interference contrast, dry objective. However, observations under oil immersion, using interference and phase microscopy, revealed the presence of only one true septum per spore. Any divisions of the protoplasm within the halves of the spore were indeed rudimentary. The differences between the *Gilletiella* and the *Antennularia* are summarized in TABLE 1.



FIGS. 1-3. Gillettiella chusqueae, Sydow 1202. 1. Longi-section through colony, showing fruiting bodies underneath compact stromatal layer, X200. 2. Edge of stroma, X370. 3. Longi-section through stroma and hypostroma, X370. Figs. 4-5. Antennularia chusqueae, Sydow 441. 4. Longi-section through colony, showing fruiting bodies on mycelium, and several Isaria conidiophores (left half of picture), X200. 5. Longi-section through center of colony, showing hypostroma, X200. Fig. 6. Gillettiella chusqueae. Portion of hymenium (stained), X700. Fig. 7. Antennularia chusqueae, Rehm 1399 (as Dimerina negeriana). Asci and ascospores, X700.

TABLE 1.

Differences between *Gillettiella chusqueae* and *Antennularia chusqueae*

Fungus	Habit	Fruiting Bodies (diam.)	Asci	Ascospores	Conidia
<i>Gillettiella chusqueae</i>	Epiphyllous; fruiting bodies immersed in stroma; hypostroma shallow, effuse.	Ca. 135-160µm	Slender, narrowly oblong-ellipsoid, densely ?pseudo-paraphysate; 50-55 X 10-13µm (80 X 10µm, fide Pat.; 70-80 X 10µm, fide Theissen & Sydow).	15-16 X 4-5µm (11-15.5 X 5-6µm, fide Sydow; 20 X 5-6µm, fide Pat.	See text.
<i>Antennularia chusqueae</i>	Hypophyllous; fruiting bodies superficial on subiculum; hypostroma central, deep.	Ca. 45-90µm	Obclavate to ellipsoid, ± expanded below, apparently apara-physate at maturity; 23-45 X 8-12µm.	7-14 X 2-3.5µm	<i>Isaria acaricida</i> Pat.

Antennularia chusqueae is not congeneric with *Gilletiella chusqueae*; its taxonomic position, however, is still uncertain. As previously pointed out (Farr, 1966) it differs in several characteristics from other species of *Antennularia* sensu Müller & Arx (1962). Furthermore, according to Hughes (1970), *Antennularia* is an ambiguous name and, following this disposition, the genus was partly dismantled by Barr (1971) who transferred the venturiaceous species to *Protoventuria* Berl. & Sacc. Possibly *A. chusqueae* could be accommodated in *Protoventuria* subgen. *Capnoda* (Barr) Barr. *Gilletiella* on the other hand, because of its subcuticular ascocarps with radiate wall structure, may belong in the Munkiellaceae, as suggested by M. E. Barr (personal communication).

I thank E. Horak (ZT) and D. H. Pfister (FH) for lending me type material of *Gilletiella chusqueae* for study, and M. E. Barr Bigelow for critically reading the manuscript.

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Vol. VI, No. 1, pp. 173-177

July-September 1977

HYPOXYLON TERRICOLA MILLER DANS LE MIDI DE LA FRANCE, ESPÈCE NOUVELLE POUR L'EUROPE

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SUMMARY

Hypoxylon terricola, known previously from a single collection in Michigan, has been found in three sites in southern France, in each instance under *Cedrus atlantica*.

Au cours des excursions mycologiques dans les Basses Alpes, lors du VIème Congrès Européen des Mycologie (Avignon 19-27 Octobre 1974) nous récoltons pour la première fois sous *Cedrus atlantica* un *Hypoxylon* aciculicole que nous avons identifié comme *Hypoxylon terricola* Miller.

A la suite de nos recherches en Europe, aux Etats Unis, et en Nouvelle Zélande, il ne nous a pas été possible de trouver trace d'aucune autre récolte d'*Hypoxylon terricola* si ce n'est celle de Smith, 1932, à Whitmore Lake Michigan, laquelle constitue la récolte-type dans l'herbier Julian H. Miller de l'Université de Georgie.

Avec cette dernière nous avons pu faire une confrontation de nos récoltes et confirmer notre détermination: *Hypoxylon terricola* Miller (in Miller, "A Monograph of the World Species of Hypoxylon," Univ. of Georgia Press, Athens, Georgia, 1961).

STROMA superficiellement gris-clair, puis devenant brun foncé une fois mûr, avec ostiole proéminente noire, agglomérant les aiguilles de cèdre et les brindilles en s'étendant de 3 à 15 mm environ de large sur 1,3 mm d'épaisseur (FIGS. 1, 2, 4). PÉRITHÈCES de forme irrégulière, plus ou moins comprimés et confluent (300 à 500 µm de diamètre). A la

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coupe (FIG. 1) les parois de 150 μm d'épaisseur environ sont noires et permettent de voir les périthèces plus ou moins immergées dans la chaire du stroma qui demeure blanche. ASQUES 140-165 $\times$ 9,5-11 μm (FIGS. 3, 6, 7). SPORES 14-17,5 $\times$ 6,5-7,5 μm , obliquement unisériées, fusiformes, entourées d'une enveloppe gélatineuse qui disparaît à maturité (FIGS. 3, 5-7). PARAPHYSES septées certaines rameuses de 6-9 μm de large (FIGS. 6, 7). HYPHES brunes du mycélium environ 6 μm de diamètre. HABITAT sur le sol, dans les aiguilles, sous *Cedrus atlantica*: Revest du Bion (800m alt.), Basse Alpes, dept. 18, 20-10-74. Petit Lubéron (1000m alt.), Basse Alpes, le 23-10-74. Forêt des Ecrivains Combattants (1000m alt.), Bédarieux, Hérault, le 16-10-76 et le 4-1-77 (récoltes F. Candoussau).

DISCUSSION

Bien qu'un rapprochement soit à faire avec *Hypoxylon diathrauston* Rehm, en raison de son habitat sur conifères et de ses spores jeunes avec enveloppe gélatineuse, *H. terricola* s'en distingue par son stroma qui épouse les irrégularités du substratum et n'est jamais enforcé ni érupant, ainsi que par la mensuration de ses spores: 14-17,5 $\times$ 6,5-7,5 μm contre 20-36 $\times$ 12-18 μm pour *H. diathrauston*.

Si nous comparons nos récoltes françaises avec la récolte type du Michigan, nous les trouvons macroscopiquement identiques. Microscopiquement, la variation des asques en longueur n'étant pas à considérer, nos récoltes s'identifient bien à celle de Smith. En ce qui concerne les paraphyses, Miller les décrit comme "filiforme" nous les avons vues d'un diamètre minimum de 6 μm sur la récolte de Smith comme sur les nôtres. Cette dimension nous paraît trop importante pour la qualifier de "filiforme."

Simplement les récoltes françaises diffèrent légèrement en ce qui concerne l'habitat et l'époque:

- * les conifères de la récolte de Smith dans le Michigan ne sont pas des cèdres, mais semblent être des conifères à aiguilles plus courtes;

- * aucune de nos récoltes n'ont été faites sur place à feu, comme l'était la récolte de Smith (d'où le nom terricola donné par Miller);

- * les trois stations sont en basse altitude 800-1000m a-

FIGS. 1-5, *Hypoxylon terricola*, stromata, ascus et ascospores. 1-3, récolte Françoise Candoussau, 4-1-77, CUP 54957 (= Herb. Candoussau 5285). 1, $\times 3.5$. 2, $\times 2$. 3, $\times 625$. 4-5, récolte Smith, 20 Mai 1932, GAM-Miller 2337. 4, $\times 2$. 5, $\times 625$.





FIGS. 6-7. *Hypoxylon terricola*, thèques avec huit spores et leur enveloppe gélatineuse-hyaline, portions de paraphyses rameuses, spores mûres, $\times 625$. 6, CUP 54957. 7, GAM 2337.

lors que la station américaine n'est qu'à 270m;

* nos récoltes sont quasi hivernales et récoltés plus tôt les carpophores ne sont pas entièrement murs.

Au sujet de la distribution géographique de cet *Hypoxylon terricola*, nous avons montré notre récolte de Bédarieux au Pr J. A. von Arx qui l'a identifié à *H. terricola* Miller, nous a signalé que le Dr H. A. van der Aa l'avait lui aussi récolté au Petit Lubéron le 23-10-74 durant le VIème Congrès Européen de Mycologie (in litt. 26-11-76) et pensent qu'il s'agit de la première récolte en Europe.

Le Pr Hennebert a également fait une récolte de cet *Hypoxylon* dans les deux localités du Revest du Bion et au Petit Lubéron lors du VIème Congrès Européen de Mycologie (in litt. 17-4-77).

Monsieur G. Malençon ne connaît pas *Hypoxylon terricola* en Afrique du Nord ni en Europe (in litt. 23-11-76).

Le Dr Hanlin de l'Université de Georgie nous a répondu: "So far as I am aware, this (the collection of Smith) is the only collection of this species from North America."

Dr Gary Samuels de Nouvelle Zélande, D.S.I.R. Auckland, nous a écrit: "Nous n'avons pas *H. terricola* Miller ici, au moins sous ce nom" (in litt. 5-3-77).

Dr Jack Rogers de Washington State University nous écrit: "As far as I know, *H. terricola* Miller has not been reported in North America since Smith collected it. However it is very possible that it has been collected and placed in a herbarium without being recorded." Pour cette raison nous ne pouvons affirmer qu'il s'agit d'une première récolte depuis la récolte type de 1932.

En conclusion *Hypoxylon terricola* semble largement répandu dans le Midi de la France sous *Cedrus atlantica* où nous l'avons récolté abondamment et un peu partout dans les trois stations citées.

Nous remercions vivement le Dr Jack Rogers, Washington State University et le Dr G. L. Hennebert, Université de Louvain d'avoir lu notre manuscrit et de nous avoir fait part de leurs suggestions.

Nous remercions également le Dr R. T. Hanlin pour le prêt de la récolte type, le Dr. J. A. von Arx pour avoir confirmé notre détermination, le Dr G. Durrieu, Université Paul Sabatier, Toulouse, et Mr H. Lyon, Cornell University, Ithaca, N.Y. de s'être occupés des photographies.

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Vol. VI, No. 1, pp. 178-180

July-September 1977

A NEW SPECIES OF PSORA (LICHENES: LECIDEACEAE) FROM TEXAS AND MEXICO

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SUMMARY

Psora texana, a calcicole saxicolous species characterized by its spherical spores and distinctive, complex chemistry, is described from central Texas, U. S. A., its greater range extending far into Mexico.

PSORA TEXANA W. A. Weber, *sp. nov.*

Thallus senatus interdum flavescens vel viridiflavus vel flavobrunnescens mutabilis, squamulosus, rosulatus, usque ad 3-4 cm diam, squamulis marginalibus usque ad 5 mm diam, planis vel concavis vel convexo-undulatis, marginibus adscendentibus liberis; squamulis interioribus bullatis rugosis inflatis arcte affixis, 2-3 mm diam ("*Thalloedema*" revocans), subtus pallidis et flavescens. Cortex pseudoparenchymaticus, 30-50 μ m crassus, strato amorpho nullo vel usque ad 5 μ m crasso, K+ violascens, C+ persistente rufescens, P-, UV-, strato algarum continuo. Medulla flava, compacta, interdum excavata, hyphis 3-4 μ m diam, C+ ex parte rufescentia, P+ cinnabarina, UV-. Apothecium atropurpureum, sessili, convexi, base plus minusve constricti, margine inconspicuo mox excluso; epihymenio gelatinoso, nec granuloso nec pigmentifero, hymenio rubro-violaceo, 40-50 μ m alti, I+ vinoso-rubescens, K-, hypothecio vitreo, hyphis conglomeratis luminibus angustis, ascis clavatis brevibus, usque ad 20x7 μ m, paraphyses cylindricis, non capitatis, 2-3 μ m crassis, matrice gelatinoso, sporis 8-nis, unicellularis, hyalinis, sphaericis, 3-4 μ m diam. Pycnidia punctiformia, depressa, margine ostiolorum aurantiaco, pycnoconidiis rectis vel plus minusve curvatis, 6-7x1 μ m. Ad saxa calcarea.

Thallus the color of raw sienna, varying toward yellow, reddish, greenish-yellow and yellow-brown, squamulose, forming rosettes up to 3-4 cm diam; marginal squamules up to 5 mm diam, plane, convex-undulate to rarely concave, ascending with free margins; interior squamules bullate, rugose, inflated, tightly affixed, 2-3 mm diam (recalling "*Thalloedema*"), lower corticated surface pale yellowish; upper cortex pseudoparenchymatous, 30-50 μ m thick, K+ violet, C+ reddish persistent, P-, UV-, amorphous layer lacking or up to 5 μ m thick; algal layer continuous; medulla yellowish, compact (in very large squamules becoming excavated, the hyphae 3-4 μ m diam, C+ reddish-brown in spots, P+ cinnabar, UV-). Apothecium black to purplish-black, sessile, highly convex, somewhat constricted at the base, the margin inconspicuous, soon excluded; epihymenium gelatinous, neither granular nor pigmented; hymenium reddish-violet, 40-50 μ m high, I+ vinose-red, K-; hypothecium of conglutinated vitreous hyphae with very narrow lumina; asci clavate, unitunicate, slightly thickened apically, lacking amyloid fine structures, short, up to 20x7 μ m; paraphyses stout, cylindrical, not capitate, grading into the vertically oriented tissues of the hypothecium, 2-3 μ m thick, in a gelatinous matrix; spores 8/ascus, one-celled, colorless, spherical, 3-4 μ m diam. Pycnidia punctiform, depressed, the ostiolar margin orange or reddish; pycnoconidia straight or slightly curved, 6-7x1 μ m. Saxicolous, on limestone.

TYPE COLLECTION. Texas, U. S. A. Llano County: Guadalupe River Canyon along Highway 39, 14 mi SW of Ingram on road to Leakey; limestone rimrock along ridge, *Juniperus-Quercus* woodland; forming rosettes on vertical faces of limestone cliffs, 29 April 1974, W. A. Weber, *Lich. Exsicc.* COLO No. 448 (Holotype COLO, 59 isotypes distributed).

ADDITIONAL RECORDS. Mexico. Coahuila: on Sierra de San Marcos opposite Los Fresnos, above Cuatro Cienegas Basin, 4 April 1969, D. K. Pinkava 6162 (ASU, COLO); San Luis Potosi: Canoas, on rocks, 3000 ft. alt., 16 July 1890, C. G. Pringle 268 (COLO); Tamaulipas: road from Ejido to Casa Piedra near Rancho del Cielo above Gomez Farias, on open surface of a boulder, August 1974, A. J. Sharp 8720 (ASU, UT); Chiapas: road to El Suspiro, 5-7 km N of Berriozabal, on rocks in scrubby deciduous pasture, mist forest, 920 m, 22 March 1960, M. E. Hale & T. R. Soderstrom 20.125(US).

This unique species has been studied independently by several lichenologists including Prof. Rolf Santesson, Mason Hale, Prof. Hannes Hertel and G. Schneider (all unpublished). Dr. Chicita Culberson analyzed the type material and reported (*in litt.*) that "this lichen has an extremely complex chemistry. There are 12 or 13 compounds present in quantities easily detectable by TLC. I am not able to identify any of these compounds with certainty.... Most of them give visible spots on the chromatograms and are probably pigments." Huneck and Follmann (1976) reported this collection to contain Fragilin, Parietin and unidentified anthraquinones.

The rich sienna coloration and discrete squamulose rosettes of this species, its extraordinary chemistry and its spherical spores make *Psora texana* unique. Hertel (*in litt.*) suggests that as the collective genus *Lecidea* becomes better understood, this species may prove to be better classified as a monotypic genus.

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MYCOTAXON

Vol. VI, No. 1, pp. 181-185

July-September 1977

NEW TAXA OF CLITOCYBE

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In the study of specimens for a monograph of the genus *Clitocybe* in North America, a few species have been encountered which do not fit satisfactorily into the established infrageneric taxa of the genus. Thus it has become necessary to erect two new subgenera to accommodate the following new species.

Clitocybe subgenus *Mutabiles* Bigelow, subgenus novum

Pileus violaceo-brunneus ad vinaceo-brunneus, hygrophanus, pallescens. Lamellae violaceo-griseae ad violaceo-brunneae vel vinaceo-brunneae. Stipes concolores pileus vel lamellae. Sporae amyloideae, leves, in cumulo candidae. Hyphis fibulatae. Terricolae.

Typus: *Clitocybe mutabilis* Bigelow

Clitocybe mutabilis Bigelow, species novum

Pileus 1-3(-4.5) cm latus, primum convexus, margine incurvatus, demum planus, saepe striatus, depressus, glaber vel fibrillosus vel furfuraceus, hygrophanus vel subhygrophanus, vinaceo-brunneus, demum pallescens ut opacus. Odor et sapor nulles. Lamellae adnatae tum decurrentes, angustae vel moderate latae, plerumque subdistantes, arcuatae, primum lilacinae dein vinaceo-brunneae, pallescens et plus incarnatae in vetustate. Stipes 2-3(-5.5) cm longus, 2-6 mm crassus, farctus mox cavus, tenax, glaber tum fibrillosus ad furfuraceus vel pruinosis, cum lamellis concolor vel purpureo-griseus, brunnescens. Sporae (6.5-)7-9(-11) x 4-5.5(-6) μ m, levis, plerumque amyloideis; hyphis fibulatis. Holotypus legit A. H. Smith, n. 64893, Boulder Lake, Valley Co., Idaho, 17 June 1962 (MICH).

Pileus 1-3(-4.5) cm broad, convex at first with the margin incurved, becoming plane, margin often striate, disc often shallowly depressed, in age the margin sometimes uplifted and the disc more deeply depressed, surface glabrous appearing when moist, fibrillose or sometimes furfuraceous when faded, hygrophanous, shades of brown to vinaceous brown or violaceous when moist, paler when faded or in age (dingy buff to alutaceous or "wood brown"¹ and then opaque); context thin, pliant, concolorous with pileus. Odor and taste not distinctive.

Lamellae broadly adnate at first, becoming short decurrent to long decurrent, narrow to moderately broad (up to 3.5 mm), usually subdistant, arched, forked and intervenose at times, violaceous young ("deep dull lavender"), then violaceous brown to vinaceous brown ("light brownish drab" to "vinaceous drab"), finally paler and more flesh tinged ("light vinaceous fawn"), sometimes darkening in age ("snuff brown").

Stipe 2-3(-5.5) cm long, 2-6 mm thick, equal or either end slightly enlarged, fluted and curved at times, tough, stuffed soon hollow, surface glabrous when moist, later fibrillose to scurfy or pruinose, upper portion concolorous with lamellae or darker ("purple drab," "dark purple drab") brown near base or overall in age, base sometimes with pale lilac mycelium and a few white rhizomorphs.

Spores (6.5-)-7-9(-11) x 4-5.5(-6) μm , elliptic to broadly elliptic, sometimes obovate, smooth, amyloid, deposit white. Basidia 33-51 x 6-9 μm , mostly 4-spored, sometimes 1- or 2-spored. Pileus surface subgelatinous appearing in KOH, brownish in KOH at first soon fading to dull vinaceous or brownish pink, finally yellowish, pigment in cell contents or at times very finely encrusted, cutis hyphae cylindric, 1.5-5.5 μm diam, end cells protruding at times; context hyphae cylindric, 3-10 μm diam. Hymenophoral trama of undulate-subparallel hyphae, mostly cylindric, 2-7 μm diam. Oleiferous hyphae occasionally present. Clamp connections present.

Scattered to gregarious. On soil and needles under conifers, occasionally in mountain meadows or at edges of snow banks. June and July, September and October.

¹Colors in quotation marks are from Ridgway (1912).

Material examined: Idaho: Bigelow 1950, 1953; Miller 5206, 5309; Smith 5481, 64893 (type), 64983, 65054, 65200, 69100, 71243. Oregon: Smith 18106, 28114. Utah: McKnight Fl169. Washington: Bigelow 2086; Imshaug 214. Wyoming: Smith 34304, 34305, 34321, 34332, 34401, 34443, 34448, 34449 (all MICH).

Discussion: *Clitocybe mutabilis* is closely related to *C. cokeri* Hesler which also belongs to subgenus *Mutabiles*. Both species have very similar colors as well as amyloid spores and clamp connections. From *C. cokeri*, *C. mutabilis* differs by the lack of a farinaceous odor and taste.

Clitocybe mutabilis is generally a smaller species and does not have a silvery white coating of fibrils on the stipe like *C. cokeri*. On present records of distribution, the two appear to be isolated geographically as *C. cokeri* is known only from Tennessee.

Pseudoclitocybe bacillaris (Pers.) Singer was compared because of its violaceous gills and amyloid spores, but, according to Singer's (1961) examination of the type, Persoon's species has no clamp connections, no encrusting pigments, possibly cheilocystidia, and a long slender stipe. These features are too diverse from *C. mutabilis* to make identity at all likely. *Clitocybe violaceifolia* Murrill was another possibility, but this has nonamyloid spores and was collected on wood.

Clitocybe subgenus *Lazulinae* Bigelow, subgenus novum

Pileus et stipes lazulinus. Lamellae cremeae, interdum marginatae. Pigmentum incrustatum. Sporae leves, inamyloideae. Hyphis fibulatis. Terricolae.

Typus: *Clitocybe lazulina* Bigelow

Clitocybe lazulina Bigelow, species novum

Pileus usque ad 7 cm latus, late convexus ad plus minusve flabellatus, fibrillosus vel ad centrum velutinum, lazulinus. Lamellae decurrentes, angustae vel sublatae, confertae vel confertissimae, cremeae, interdum lazulino-marginatae. Stipes usque ad 7.5 cm longus, 5-12 mm crassus, subclavatus, eccentricus, superficies sursum diffractus, deorsum fibrillosus, lazulinus. Sporae 6.5-8.5 x 5.5-6(-7)

μm , ellipticae ad subglobosae, leves, inamyloideis. Hyphis fibulatis. Carpophoria subcaespitosa apparenter, in foliis putridis in sylvis praecipue quercines montibusque. Holotypus legit Ruth McVaugh (n. 700), 2 Nov 1960, prope Amacueca, Jalisco, Mexico (MICH).

Pileus up to 7 cm broad, convex with a broadly recurved margin to more or less flabelliform, radiate fibrillose on the margin and inward but disc with a few erect fibrillose points under a lens, grey blue (dried: margin "neutral gray" to "gray, n. 6"; darker grey blue inward, "slate gray," "slate color"), disc blackish blue (dried: "blackish slate"). Odor and taste not known.

Lamellae long decurrent, narrow to moderately broad, close to crowded, forked, not intervenose, probably cream color fresh but drying to "warm buff," edges dark blue marginate in places.

Stipe up to 7.5 cm long, apex to 5 mm thick, base sub-clavate and 12 mm thick, eccentric, surface diffracted scaly at apex, base matted fibrillose, grey blue (dried: "neutral gray" to "slate gray"), apparently solid or stuffed within although presently damaged by larval activity.

Spores 6.5-8.5 x 5.5-6(-7) μm (excluding apiculus), elliptic to broadly elliptic, sometimes subglobose, smooth, walls thickened at times, inamyloid, acyanophilous. Basidia 29-35 x 6-7.5 μm , 4-spored, siderophilous granules absent, some basidia with rod-shaped incrustations at base, sterigmata up to 8 μm long, somewhat ampullaceous. Cystidia absent. Pileus cutis blue in KOH and water, pigment as scattered granules and rods on surface of cutis hyphae when mounted in Melzer's, cotton blue or water. (In KOH the incrustations dissolve or disperse; walls then appear smooth and pale blue.) Cutis hyphae cylindric or slightly inflated, 6-12.5 μm diam, protruding as groups of end cells in places; context hyaline to pale dingy yellowish in KOH, hyphae cylindric or inflated, 2.5-18 μm diam, walls thin or thickened up to 1 μm , smooth. Hymenophoral trama of undulate-subparallel hyphae, cylindric or slightly inflated, 3.5-14 μm diam, walls thin or thickened, some lamellae with blue areas from incrustated pigment on base of basidia and short adjacent hyphae, subhymenium $\pm$ dextrinoid. Oleiferous hyphae short, scattered in pileus context and hymenophoral trama.

Subcespitoso in humus (presently, one clump of three basidiocarps and two single ones). Known only from the type collection.

Discussion: While it is usually not desirable to describe an agaric from dried specimens, the unusual color of this species seems to justify an exception. The only field notes by the collector are "beautiful grey blue, darker at center of cap top;" the other field characters of the basidiocarp have been determined by observations on the herbarium material. Undoubtedly the dimensions of the pileus and stipe would be larger in fresh specimens than stated in the description.

A search of the literature for a blue *Clitocybe* or *Pleurotus* has not revealed any species at all close to *C. lazulina*. The colors of *C. lazulina* recall *Nolanea* or *Entoloma* as do the marginate lamellae, but there was no indication of angularity or ornamentation to the spores.

ACKNOWLEDGMENTS

I am indebted to Dr. Ruth McVaugh, Dr. Alexander H. Smith, and Dr. Robert L. Shaffer, Director, University of Michigan Herbarium, for the opportunity of studying the specimens which provide the basis of this paper. Dr. Smith also kindly loaned me his notes on *Clitocybe mutabilis*. I would like to thank Dr. L. R. Hesler for his kindness in loaning me specimens of *Clitocybe cokeri*.

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MYCOTAXON

Vol. VI, No. 1, pp. 186-188

July-September 1977

A NON-LICHENIZED SPECIES OF RAMONIA

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Ramonia Stiz. is presently circumscribed to include twelve species of crustose lichens (Vežda, 1966; 1967; 1973), and is characterized by immersed to erumpent apothecia, thin-walled, unitunicate asci lacking iodine reactions, true paraphyses, a margin lined on the inner face with periphysoids, and colorless spores which are either unicellular or septate with uniformly thickened walls and cylindrical cell lumen. Recent opinion (Vežda, 1966; Hale and Culberson, 1970; Poelt, 1973; Sherwood, 1977) favors placing the genus in the Ostropales. *Ramonia* shares a number of morphological features with *Stictis* Pers., differing principally in the lack of crystalline inclusions in the margin, the presence of a distinct lichen thallus, shorter, few-septate, sheathed spores, and the polysporous asci of many of the species.

An erumpent Ascomycete on dry weathered wood, tentatively identified by A. Vežda as "*Ramonia non lichenisata*" is a well-developed and abundantly-fruitletting collection which lacks all traces of a lichen thallus but is otherwise referable to the lichen genus *Ramonia*. The species, which has no name in *Ramonia* and could not be identified from the mycological literature, is here described as a new species, *Ramonia athallina*.

RAMONIA ATHALLINA Sherwood, spec. nov.

Figure 1

Ascomarpi primum immersi, profunde cupulati, 0.3-0.5 mm diam., margine integro, nigro, disco brunneo. Margo in sectione transversali 100 μ m crassus, siccus ab hymenio se abrumpens, hypharum pariete 2-4 μ m diam., brunneo. Stratum crystallinum abest. Periphysioidea 5-10 x 1.5-2 μ m, non ramosae. Paraphyses filiformes, non ramosae, achromae, in iodo non caerulescentes. Asci 70-90 x 10-15 μ m, apice non incrassatae, 16-spori. Sporae 65-85 x 1.2-2.0 μ m, cellulis 7-12 μ m longis, ad septa se disjunctibus et articulos 1-septatis formantibus.

HOLOTYPE: CUP 55860, Bulgaria, Montes Pirin, sub hospitem Vichren, alt. 1000 m. Ad lignum Pini peuce, A. Vežda, VIII.1966; ISOTYPE: Herb. Vežda.

Apothecia at first immersed in bleached and decorticated wood, not associated with a lichen thallus, 0.3-0.5 mm diam., becoming partially erumpent, globose, opening by a pore, deeply urceolate, the disc brown, splitting away from the

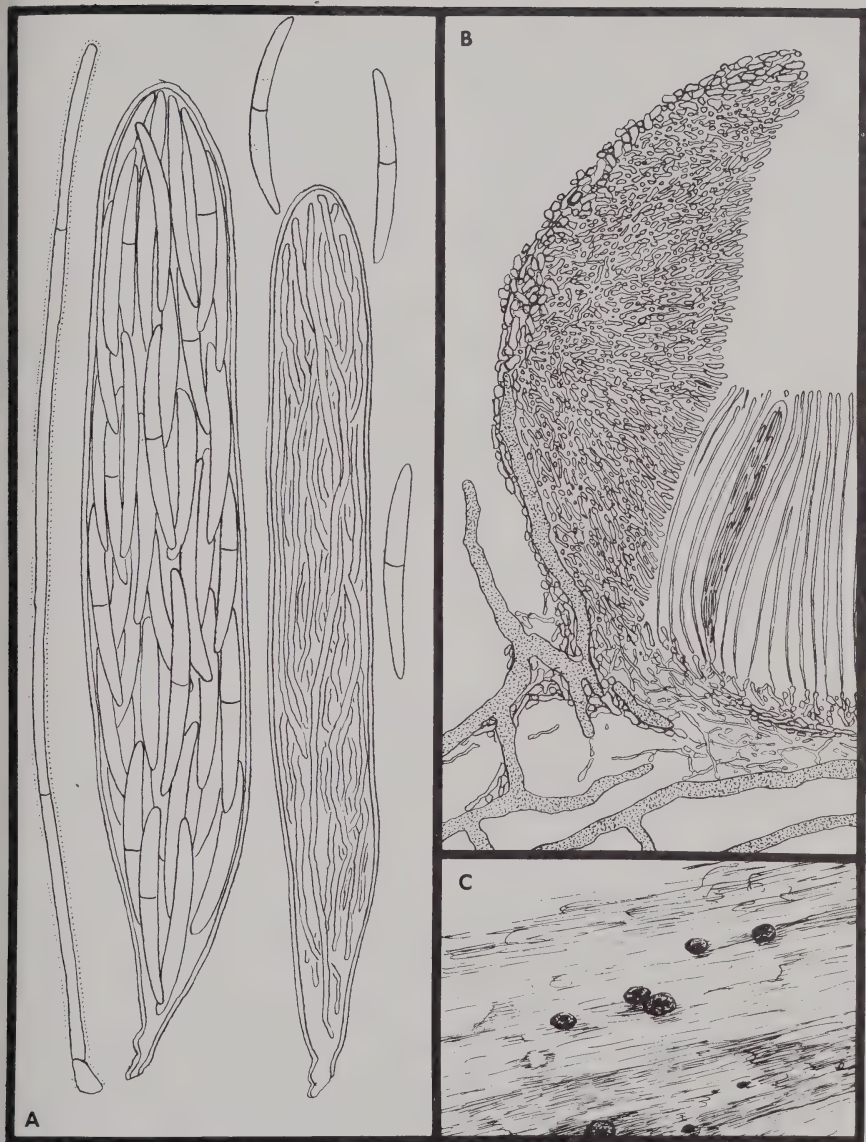


FIGURE 1. *Ramonia athallina*. A. Asci, paraphyses, spores, and part-spores, x1500. B. Cross section of margin, x375. C. Habit sketch, x7.5. Drawn from the holotype.

margin when dry, the margin entire, striate, black and shining, not pruinose.

Margin in cross section ca. 100 μm thick, without any crystalline inclusions, the outermost layer 10-20 μm thick, of thick-walled, dark, more or less isodiametric cells 2-4 μm diam., intermingled with brown amorphous material, not continuing beneath the subhymenium. The remainder of the margin consists of colorless, somewhat gelatinous hyphae 1.5-2.0 μm diam., interwoven, oriented more or less perpendicularly to the surface of the ascocarp and ending in a fringe of unbranched periphysoids 5-10 x 1.5-2 μm . Asci 70-90 x 10-15 μm , clavate, short-stalked, uniformly thin-walled, without an obvious apical mechanism, J-, initially 16-spored. Spores 65-85 x 1.2-2.0 μm , at first three-septate, disarticulating at the septa to form part-spores 16-25 x 1.2-2.0 μm , these eventually becoming 1-septate. Paraphyses numerous, filiform, 1.0 μm broad, barely enlarged above, obscurely sheathed, J-. On decorticated pine wood, Bulgaria.

Ramonia athallina differs in several respects from *R. valenzueliana* (Mont.) Stiz., the holotype of *Ramonia*, and from Vežda's (1966) emended description of the genus. In addition to lacking a lichen thallus, *R. athallina* is anomalous in lacking the J+ reaction of the hymenial gel, and in having unshathed spores.

Initially polysporous asci exclude *R. athallina* from *Stictis* and *Melittosporiella* Höhn. As nearly as I can determine from light microscope investigations of *R. valenzueliana* (See Sherwood, 1977) and an isotype of *R. micrococca* Vežda, the asci of these two species are also initially polysporous.

ACKNOWLEDGEMENTS

The author wishes to thank A. Vežda for loaning her the specimens of *R. athallina* and *R. micrococca*. William Dress assisted in preparing the Latin diagnosis.

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Vol. VI, No. 1, pp. 189-192

July-September 1977

REDETERMINATION OF THE INDIAN COLLECTIONS OF *PLICARIA TRACHYCARPA*

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The genus *Plicaria* Fuck. emend. Boud. (Pezizales) is well represented in India. *Plicaria papillosa* Batra, *P. pseudoplichonis* Batra (Batra, 1960) and *P. himalayensis* Thind & Waraitch (1971) have been well described as new species from this country. *P. trachycarpa* (Curr.) Boud. and *P. carbonaria* (Fuck.) Fuck. have variously been described as *Lamprospora trachycarpa* (Curr.) Seaver and *L. trachycarpa* var. *ferruginea* (Fuck.) Thind & Sethi (1957). The identity of *P. trachycarpa* and *P. carbonaria* has been confused by the Indian workers (Thind & Sethi, 1957; Batra & Batra, 1963) and Indian collections have often been wrongly classified. In fact, all previously described Indian collections belong to *P. carbonaria*, and none represents *P. trachycarpa*.

P. carbonaria and *P. trachycarpa* are quite similar species but the former differs in having much larger warts on the ascospores. The other details in both species, such as colour, measurements of different constituents and anatomical characters resemble each other. This is the reason why various Indian collections have been misidentified. The Indian collections have been restudied, however, and their exact position ascertained.

There are 6 Indian collections in the herbarium of the Botany Department, Panjab University, Chandigarh, India, which have been variously accommodated in *Lamprospora trachycarpa* and *L. trachycarpa* var. *ferruginea*. All 6 collections have been restudied. The two collections from the Mussoorie Hills (Herb. Nos. 135 and 135-A) were placed in *L. trachycarpa* and var. *ferruginea*, respectively, by Thind & Sethi (1957). The variety was said to possess "large and more densely pustulate apothecia" than the typical species. In this, they followed Edith K. Cash (*pers. comm.* with Prof. K. S. Thind) who keeps var. *ferruginea* (Boudier: Icon. Mycol., pl. 306) separate from typical *Plicaria trachycarpa* (Boudier: Icon. Mycol., pl. 305). However, reexamination of both these collections reveals that there is no clear-cut difference in the number or size of tubercles on the external surface of the apothecia. These tubercles are rather prominent and large in both collections. Moreover, the apothecia of Herb. No. 135 are mostly immature, and the apothecia of Herb. No. 135-A are

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bigger otherwise. So it is evident that both the collections are one and the same, a species or a variety. However, due to the bigger size warts of the ascospores, both belong to *P. trachycarpa* var. *muricata* Grelet (= *P. carbonaria*). Further, collection No. CUP-IN 122 (= L.R.B. 114) put by Batra and Batra (1963) under *P. trachycarpa*, along with Herb. No. 135 of Thind and Sethi (1957), should automatically belong to *P. carbonaria* as Herb. No. 135 is *P. carbonaria* and not *P. trachycarpa*. Collection No. 83, also from the Mussoorie Hills, evidently belongs to *P. carbonaria* due to its spore characters.

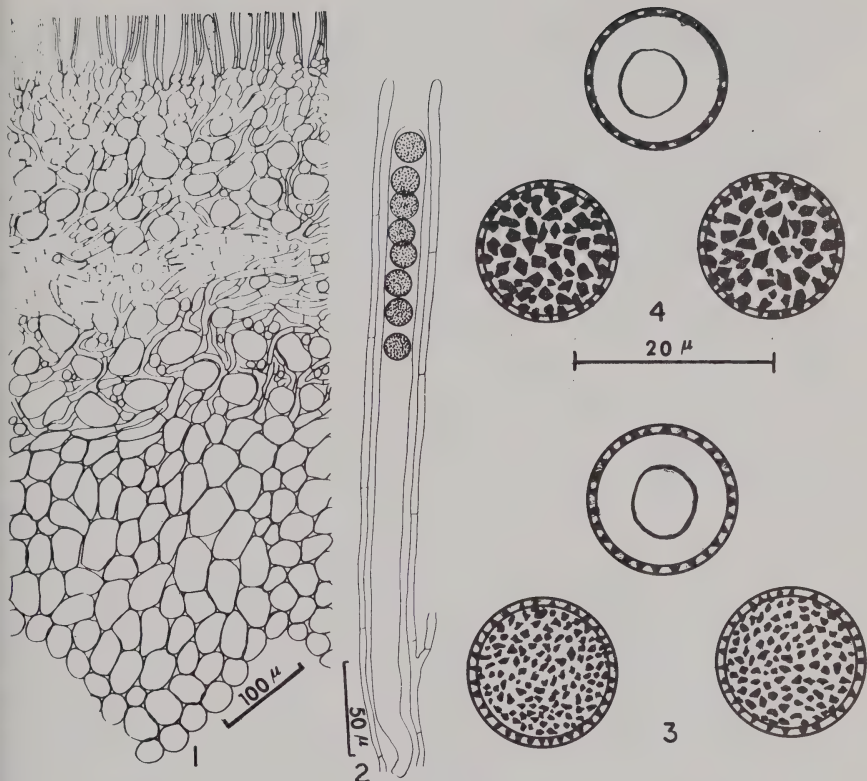
Following Thind and Sethi (1957) the collections from the Simla Hills (Coll. Nos. 152a and 152b, = Waraitch 2428 and 2429, respectively) were accommodated in *Lamprospora trachycarpa* var. *ferruginea* by Waraitch (1962) on the basis of bigger warts on the external surface of apothecia. However, these have also been found to be the same as the above mentioned collections. These collections cannot be separated into groups on the tubercule size on the apothecia or on any other character, external or internal, and all belong to *P. carbonaria*.

Collection No. 153 (= Waraitch 2430), for which a new, but unpublished, variety of *L. trachycarpa* was proposed by Waraitch (1962) is a true *P. trachycarpa* due to the smaller warts of the ascospores, though warts of the apothecia are quite comparable to those of the other Indian collections mentioned above. The same is described here in detail based on Indian collection No. 2430, while important features of Collection Nos. 2428 and 2429 representing *P. carbonaria* are also given.

1. PLICARIA TRACHYCARPA (Curr.) Boudier, Hist. Classif. Discom. d'Eur. 50. 1907.

FIGS. 1-3.

Apothecia up to 2.5 cm in diameter, gregarious to dense, so, sessile or rounded below into a short, stem-like base, subglobose at first, later deep (up to 1.5 cm deep) to shallow cupulate, regular to slightly irregular, fleshy; external surface brown to dark brown, slightly lighter than the hymenium, tuberculed; tubercules up to 640 μ m high and 900 μ m wide at the base, dense, usually more conspicuous near the margin or in young apothecia, pyramid shaped; margin entire, tuberculed hymenium brown to dark brown, sometimes with a greyish tinge due to deposition of discharged spores, smooth. *Asci* 300-365 $\times$ 15.5-19.5 μ m, 8-spored, cylindrical, apex obtuse, J +ve. *Ascospores* 13.5-15 μ m in diameter including ornamentation and 12.5-14 μ m without ornamentation, biserial at first, uniseriate at maturity, uniguttulate, guttule filling 1/2-3/4 of the ascospore cavity, smooth and hyaline at first, later profusely verrucose and becoming brown, warts 0.4-0.6 μ m long, blunt and papillose. *Paraphyses* up to 6 μ m wide below, gradually enlarged apically up to 7.5 μ m, stout, straight, thin-walled, septate, simple or branched below, brown due to the presence of coloured spherical droplets, projecting up to 25 μ m beyond the ascial tips.



FIGS. 1-4. *Plicaria* spp. 1-3. *P. trachycarpa*. 1. V.S. of apothecium showing 3-zoned medullary excipulum. 2. An ascus and paraphyses. 3. Ascospores with papillose warts. 4. *P. carbonaria*. Ascospores with comparatively bigger warts.

Anatomy: Ectal excipulum brown, up to 750 μm thick in region of the tubercule, textura angularis to textura subangularis, cells brownish, up to 70 × 50 μm, somewhat smaller and subglobose on the outside; medullary excipulum differentiated into 3 zones: (a) outermost zone textura subglobulosa, up to 110 μm thick, cells up to 57 × 40 μm, thin-walled, intermixed connecting hyphae up to 16.5 μm wide, thin-walled, septate and branched; (b) middle zone textura intricata, up to 100 μm thick, hyphae like those of interconnecting hyphae of outermost zone but running somewhat horizontally; (c) innermost zone like the outermost zone and almost of the same thickness; hypothecium brown, up to 60 μm thick, densely textura intricata approaching textura subangularis, hyphae up to 20 μm wide.

Waraitch 2430, on soil amid mosses in mixed forest, Chedwick Falls, Simla, Himachal Pradesh, August 18, 1961.

2. *PLICARIA CARBONARIA* (Fuck.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24: 326. 1870.

FIG. 4.

Apothecia up to 2 cm in diameter, brown, externally tuberculed; tubercules up to 675 μ m high and 975 μ m wide at the base. *Asci* 245-335 $\times$ 15.5-21.5 μ m. *Ascospores* 13-14.5 μ m in diameter including ornamentation and 10.5-13 μ m without ornamentation, brown, uniguttulate, warts up to 1-2 μ m long, blunt. *Paraphyses* 6.5 μ m wide below and 7.5 μ m at the top.

Waraitch 2428, on damp soil in Oak forest, Summer Hill, Simla, Himachal Pradesh, August 27, 1960; Waraitch 2429, on soil amid mosses in Oak forest, Boileau Ganj, Simla, Himachal Pradesh, Sept. 4, 1960.

ACKNOWLEDGEMENTS

My sincere thanks are due to Dr. Richard P. Korf of Cornell University, Ithaca, for critically going through the manuscript.

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MYCOTAXON

Vol. VI, No. 1, pp. 193-194

July-September 1977

A PURPORTED FOSSIL DISCOMYCETE: ASCODESMISITES

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If the art of paleomycological taxonomy is in bad repute (Pirozynsky, 1976), its image is not enhanced by the publication of a monotypic new genus and species, *Ascodesmisites malayensis* Triv., Chat. & Verma (Trivedi *et al.*, 1973). Unfortunately the authors seem to be dead serious, and this is not some humorous hoax (Cryphal, 1956).

Twelve years earlier Trivedi and Chaturvedi (1961) reported finding two new (fortunately unnamed) genera of fungi in Tertiary coal from Malaya. The two fungi are now (Trivedi *et al.*, 1973) considered parts of the same organism (a wholly unconvincing photograph, pl. 1, fig. 1, is the documentation for the statement: "It has now been possible to clearly establish organic link between the asexual and sexual stages ..."). The so-called sexual stages are ill-defined, bulbous structures interpreted as ascogonia and male organs. The authors of these two papers seem convinced that the sexual organs of *Ascodesmis* v. Tiegh. are in some way unique among Ascomycetes; only unacquaintance with the literature of developmental mycology can account for this. The new generic name takes its basis from this supposed resemblance. That they have never seen a species of *Ascodesmis* (*cfr.* Oribst, 1961) is obvious: they report minute "fruiting bodies," illustrated (pl. 1, fig. 5) as an amorphous blob. This is an Ascomycete? The authors recognize that their material differs from *Ascodesmis*; their statement: "The sexual stages though closely related to *Ascodesmis*, differ from the same in one of the most important character, viz. the absence of paraphysis." One could add, a more significant difference is the *absence of asci*! All the filaments and structures illustrated could as well be those of an alga as of a fungus.

Equally unconvincing is the lobed structure that the authors conclude is a conidium. In both papers they propose that this is close to *Desmidiospora* Thaxt. If these are fun-

gal structures at all, they might better be interpreted as appressoria (the material examined was cuticular).

The generic and specific names have been dutifully picked up and accepted as if valid by the *Index of Fungi* (Anon. 1976), as "Fossil fungi, Pezizales." Trivedi *et al.* were not that precise: "... resembles that of members of Pezizinae or Pezizales and Agyriales.... minute fruiting body only reduced by the loss of exciple and paraphysis confirms the Agyriales affinity of the fossil.... shows a close affinity with the family Pezizaceae...." No matter, for a fungus without asci cannot be described as an Ascomycete (International Code of Botanical Nomenclature, Art. 59). Since asci are lacking, it is conceivable that the generic name is valid for a fossil genus of Hyphomycetes (or of appressoria?). I am pleased to offer the name to my colleagues in such disciplines.

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MYCOTAXON

Vol. VI, No. 1, pp. 195-202

July-September 1977

SYNOPSIS OF A NEW LICHEN GENUS,

FISTULARIELLA Bowler & Rundel (Ramalinaceae)

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SUMMARY

Twenty-seven species in Ramalina sect. Fistularia (Vain.) RHs., comprising the hollow species in Ramalina sens. lat., are transferred to the new genus Fistulariella Bowler & Rundel.

FISTULARIELLA Bowler et Rundel, nom. et genus nov.

Ramalina stirps Fistularia Vain., Etud. Lich. Brésil, Pars I: 14. 1890.

Ramalina section Fistularia (Vain.) RHs., Acta Bot. Fenn. 33: 10, 34. 1943.

Ramalina section Bitectae subsection Fistularia (Vain.) Choisy, Bull. Soc. Bot. France 104: 338. 1957.

Ramalina section Bitectae subsection Fistularia (Vain.) Choisy, Bull. Soc. Mycol. France 73: 187. 1957. (comb. inval.)

Lectotype species: Cetraria inflata Hook. f. & Tayl., London Jour. Bot. 3: 646. 1844. (Basionym of Ramalina inflata (Hook. f. & Tayl.) Hook. f. & Tayl., in Hooker f. Fl. Antarct. I: 194. 1844; = Fistulariella inflata (Hook. f. & Tayl.) Bowler & Rundel).

The genus Fistulariella comprises the species previously placed in Ramalina section Fistularia. Plants in this genus are characterized by having a hollow, usually perforate thallus (see Figure 1). In the Ramalinaceae all other genera have solid thalli, with the exception of Cenozosia. The genus Ramalina has a diverse chemical representation that is rich in β -orcinol depsides and depsidones, while Fistulariella is much more restricted containing predominately depsidones (only two depsides have been reported). Fistulariella species are usually fertile; true soredia are rare while Ramalina contains a large proportion of sorediate species (over 30%). Most of the species in Fistulariella are small fragile shrubs, usually cylindrical but occasionally somewhat compressed. A few inflated Ramalina species (such as R. fastigiata, for example) superficially appear fistulate, but, as Krog & Swinscow (1974) note, the hollow aspect of true Fistulariella is always evident. The perforations in the cortex reveal the lumen of the plant.

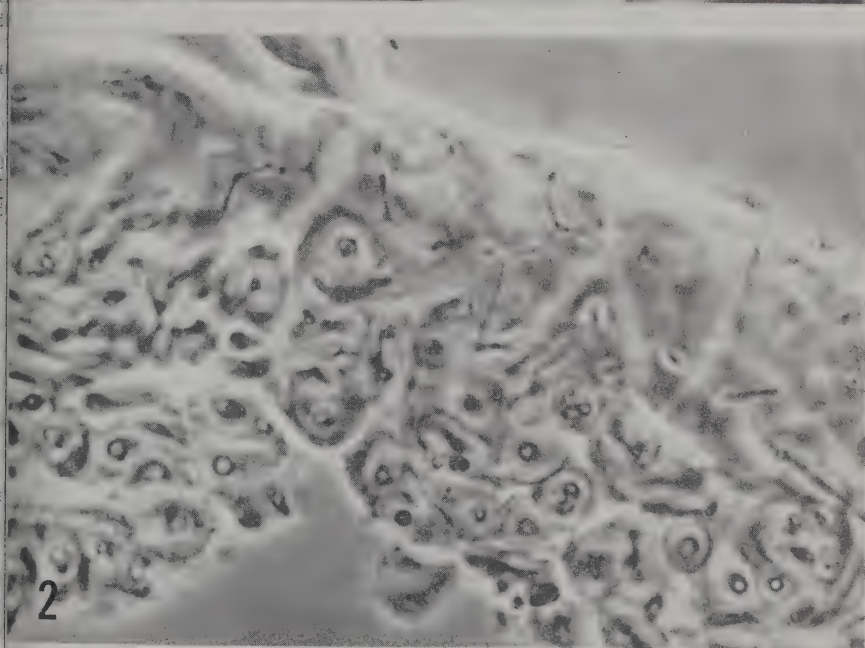
The cortex of Fistulariella is simple and consists of a rigid tubular sheath of chondroid, longitudinally aligned periclinal proso-plectenchymatous hyphae with a thin external layer of indistinct, branched cells (Figure 2). The thin outer region usually contains granules (readily dissolved in KOH), and is sometimes sparse or absent leaving only the rigid chondroid substructure. This inner layer of supportive tissue is variable in depth, and has internal ridges in some species (see Bowler, 1977; Krog & Swinscow, 1974). The algal cells may be arranged in clumps or as a more or less continuous layer, and the sparse medulla is lax, often adhering to the internal surface of the cortex. Pseudocyphellae are absent (though very common in Ramalina), and the surface of the cortex is smooth and shiny in most species. The apothecia may be terminal or subterminal, frequently either reflexing the branch or bearing a spur. True soredia are rare in this genus (F. roesleri, F. portuensis, F. fimbriata); one species produces granules (F. tapperi). With the exception of F. carpatica, the margin of the apothecia is concolorous. Pycnidia are not common, but are notable in North America in F. almquistii. Melanized pycnidia are characteristic of F. carpatica. Spores are bilocular and may be either curved or straight. Krog & Swinscow (1974) suggest that the ratio of spore width to length is a useful taxonomic character in this group.

A majority of the species in Fistulariella produce β -orcinol depsidones, usually either sekikaic acid aggregates or divaricatic acid. Chemical races with these substances alternating in occurrence appear in many species groups. A few species contain depsides, and several depsidone producing species possess norstictic or salazinic acid in the hymenium (see Krog & Swinscow, 1974). Overall chemical diversity is very low in comparison with Ramalina sens. str. No acid deficient races or species have been reported. Krog & Swinscow's (1974) excellent study of the genus in East Africa is the only modern treatment of the genus.

At least one species in Fistulariella may produce a primary thallus otherwise unknown in the Ramalinaceae. A collection from Teneriffe (F. cf. pusilla, Imshaug 36224 in MSC) had immature fistulose shrubs arising from a pale, adnate crust. Several of the largest of these primary thalli (up to ca. 4 mm in diameter) bear as many as a dozen minute fruticose individuals. The development of fruticose thalli from a crust in this manner is similar to Cladina species such as C. rangiferina when possessing a primary thallus and growing upon wood (H. Imshaug, personal communication).

Although most species have a pellucid appearance, Fistulariella carpatica has a shiny cortex that becomes blackened laterally and terminally. Often there is a melanized ring around the apothecial margin similar to the melanized apothecial margins in Trichoramalina and Desmazieria. The tips of the branches are often open and lacerate, appearing as if the tips had exploded. This tendency toward ruptured apices is exhibited by large thalli in other species, such as F. almquistii.

Figure 1. Perforations in the cortex of the cladinaform morphology of Fistulariella almquistii (Scotter 19046 Y-5 in CANL). Figure 2. Cross section of a Fistulariella species under phase at 40 $\times$ (W. A. Weber, Lichenes Exsiccati No. 343 sub. Ramalina javanica Nyl. in CANL).



Recent studies (Krog & Swinscow, 1974, 1976; Østhaugen & Krog, 1976) have found a surprising degree of endemism among the Fistulariella. The genus is predominately temperate-boreal in affinities, occurring in both the Northern and Southern Hemispheres. With the exception of East African species, taxa in Fistulariella are poorly studied. Undoubtedly many more species will be described as the floras of other areas become better known.

It is not surprising that an isolated genus with close natural affinities has developed in the Ramalinaceae, which is now known to exhibit diverse anatomical and morphological radiations (Bowler, 1977). Many unrelated families have representatives with a fruticose growth form and hollow branches. Familiar examples from the temperate zones are Cladina, Cladonia, Dactylina and Thamnomelia.

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Fistulariella almquistii (Vain.) Bowler & Rundel, comb. nov. Basionym: Ramalina almquistii Vain., Arkiv för Bot. 8: 17. 1909.

Fistulariella calcarata (Krog & Swinsc.) Bowler & Rundel, comb. nov. Basionym: Ramalina calcarata Krog & Swinsc., Norw. Jour. Bot. 21: 115. 1974.

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Fistulariella consanguinea (Müll. Arg.) Bowler & Rundel, comb. nov. Basionym: Ramalina consanguinea Müll. Arg., Flora (Jena) 68: 501. 1885.

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Ramalina javanica Nyl., Bull. Soc. Linn. Normand., Ser. 2, 4: 167. 1870.

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Ramalina minuscula Nyl., Bull. Soc. Linn. Normand., Ser. 2, 4: 164. 1870.

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Ramalina panizzei De Not., Giorn. Bot. Ital., anno II, Parte I, tomo I: 211. 1846.

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Ramalina pitardi Hue, Bull. Soc. Bot. France 58, Mémor. no. 22: 23. 1911.

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Basionym: Ramalina pocsii Krog & Swinsc., Norw. Jour. Bot. 23: 109. 1976.

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Ramalina portuensis Samp. Bol. Soc. Broteriana 2(2): 179. 1924.

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Ramalina pumila Mont., Annal. Scienc. Nat., Bot., Ser. 2, 20: 356. 1843.

Fistulariella pusilla (Le Prév.) Bowler & Rundel, comb. nov. Basionym:
Ramalina pusilla Le Prév., in Duby, Bot. Gallic. 2: 614. 1830.

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Ramalina pusiola Müll. Arg., Flora (Jena) 73: 338. 1890.

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Fistulariella taperi (Krog & Swinsc.) Bowler & Rundel, comb. nov.
Basionym: Ramalina taperi Krog & Swinsc., Norw. Jour. Bot. 21: 121. 1974.

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Ramalina tasmanica Nyl., Bull. Soc. Linn. Normand., Ser. 2, 4: 162. 1870.

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 Basionym: Ramalina translucida Krog & Swinsc., Norw. Jour. Bot.
 21: 123. 1974.

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Ramalina turgida Kremp., Verhandl. zool.-bot. Gesell. Wien 26:
 437. 1876.

The Fistulariella in North America are poorly understood, thus only a preliminary key and diagnostic notes can be provided prior to the completion of further studies. Relatively few species in this genus have been reported from North America, and some reports probably represent undescribed taxa.

Two sorediate species of Fistulariella are described for North America. The most widespread of these is F. roesleri, a polymorphic taxon including a divaricatic and a sekikaic acid race. This species, whose North American distribution was mapped by Hale (1969), is most abundant along the coastal margins of its range, extending as far south as northern California on the west coast and Maine on the east coast. Sorediate Fistulariella from maritime rocks in Alaska are F. scoparia. This taxon can be separated from F. almquistii, a sympatric saxicolous species, by its maculiform or rarely labriform soredia and the possession of sekikaic acid aggregates (Degelius, 1937; Krog, 1968). Fistulariella almquistii is predominately saxicolous with a Beringian distribution of decreasing frequency in North America (Thompson, 1972). At least two taxa are currently lumped in this species group (Krog, 1968). F. almquistii sens. str. is a coarse plant with lateral apothecia, pale (rarely superficially melanized) pycnidia, and a glossy opaque cortex. A terricolous inland form is much smaller, lacks apothecia and pycnidia, and has a translucent cortex. This undescribed taxa (see Figure 1) morphologically resembles a Cladina species, and often grows in caespitose clumps on the tundra. It appears to have a species pair relationship with F. almquistii. Krog (1968) reported divaricatic acid or unidentified substances from this complex.

Taxa referred to F. inflata and F. geniculata in North America, both containing divaricatic acid, need to be compared with Southern Hemisphere populations. Several authors have considered these two taxa to be conspecific (Howe, 1914; Landrón, 1972). In North America taxa associated with this complex have an oceanic distribution along the Pacific coast (see Du Rietz, 1929) from central California north to British Columbia and inland to the Canadian Rockies. Landrón (1972) reports F. inflata from the west Indies. Fistulariella minuscula, a widespread boreal species (Hale, 1969), is very poorly understood. It appears to merge with the larger F. inflata auct. (and F. geniculata auct.), at its western limit, while northeastern plants resemble typical European material. North American populations of this species contain divaricatic acid. Finally, a strongly inflated, robust species of Fistulariella, presently undescribed, occurs infrequently from central California north into British Columbia and east into Idaho and the Canadian Rockies. This taxon is characterized additionally by its sparse branching. Chemically it contains divaricatic acid. More study is needed to properly define this new taxon.

Ramalina obtusata (Arn.) Bitt., present in North America, has recently been placed in the section Fistularia (Krog and James, 1977). Although this taxon is clearly fistulose, fenestrations are few and differ somewhat from those of typical Fistulariella. Extreme morphological variability also complicates interpretation of this taxon. For these reasons, we prefer to provisionally retain the species in Ramalina, pending more detailed studies.

A PRELIMINARY KEY TO FISTULARIELLA IN NORTH AMERICA

1. Thallus sorediate
 2. Thallus typically corticolous, finely branched with multifid-dendroid branch tips; boreal and Pacific coast distribution.
F. roesleri
 2. Thallus saxicolous, coarse and tubular branches with maculiform soredia; Pacific coast of Alaska. F. scoparia
1. Thallus esorediate
 3. Thallus corticolous; boreal and Pacific coast distribution
 4. Thallus relatively compressed, abundantly branched.
 5. Thallus small (typically less than 20 mm); branching compact; typically northeastern United States, Canada, and Great Lakes region, but merging with the F. inflata - geniculata complex in Canada.
F. minuscula
 5. Thallus larger (commonly over 20 mm), branching open; Pacific Coast and northern Rocky mountains.
F. inflata auct.
(including F. geniculata auct.)
 4. Thallus strongly inflated and robust; sparsely branched; apothecia very broad; Pacific coast and northern Rocky Mts.
F. sp. (undescribed).
 3. Thallus saxicolous or terricolous; Beringian distribution, coarse.
 6. Saxicolous; thallus branches coarse; lateral apothecia and pale pynidia common.
F. almquistii
(typical form)
 6. Terricolous; thallus branches cladinaform; sterile.
F. almquistii
(Sterile form)

ACKNOWLEDGEMENTS

We gratefully thank Henry Imshaug for valuable discussions and the loan of his collection of Fistulariella with a primary thallus. This work was supported in part by a National Research Council of Canada Postdoctoral Fellowship through the National Museum of Natural Sciences (Ottawa) to P. A. B. and by NSF Grant DK875-19848. I. M. Brodo and Pak Yau Wong contributed helpful discussion to this project.

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Vol. VI, No. 1, pp. 203-206

July-September 1977

REVUE DES LIVRES

par

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LICHEN FLORA OF THE ANTARCTIC CONTINENT AND ADJACENT ISLANDS, par Carroll W. DODGE, xxiv + 399 p., 8°, relié toilé, 1973. Phoenix Publishing, Canaan, New Hampshire 03741, USA. Prix non indiqué.

Cet ouvrage est la somme de 35 années d'exploration et de recherches sur les nombreux échantillons récoltés sur le continent antarctique depuis la seconde expédition de l'amiral Richard E. Byrd en 1938-39 à laquelle l'auteur a participé. Quatre cent quarante six espèces de lichens sont ici rassemblées, selon leur ordre systématique, avec une nomenclature largement revue, des descriptions détaillées et les indications précises de localité et d'habitat. La nature du texte et l'absence d'illustration des espèces et même de carte géographique font de cet ouvrage un outil pour spécialistes, mais ceux-ci regretteront peut-être de ne pas disposer des références aux herbiers en face des récoltes citées. Le taxonomiste y trouvera de nombreuses nouvelles espèces, nouvelles combinaisons et noms nouveaux.

ORDEN PEZIZALES, par Irma J. GAMUNDI DE AMOS, in FLORA CRIPTOGAMICA DE TIERRA DEL FUEGO, édité par S. A. GUARRERA, I. J. GAMUNDI DE AMOS et D. RABINOVICH DE HALPERIN, tome X, fasc. 3, 185 p., 53 pl., 8°, broché, 1975. Fundación para la Educación, la Ciencia y la Cultura, Moreno 431, Buenos Aires, Argentina. Prix non indiqué.

Madame Gamundi présente un relevé descriptif et illustré de toutes les espèces de Pezizales récoltées à ce jour à la Terre de Feu. En 1960, 17 espèces seulement étaient connues, récoltées par Spegazzini, Berkeley, Rehm, Bresadola, Bommer et Rousseau et l'auteur. Depuis lors, six expéditions de l'auteur ont porté le nombre des espèces à 54, dont 5 espèces, 1 variété et 1 combinaison nouvelles. Sa classification se base sur celle de Boudier, modifiée par Mme Le Gal et par Dennis. Les descriptions et les illustrations de pleine page de chaque espèce sont excellentes. Ce livre de qualité devra se trouver dans les mains de tous les discomycétologues.

FUNDAMENTALS OF MYCOLOGY, par J. H. BURNETT, seconde édition, xiv + 673 p., ill., 8°, relié toilé, 1976. Edward Arnold Publishers Ltd, 25 Hill Street, London W1X 8LL. Prix £27.50.

La première édition de FUNDAMENTALS OF MYCOLOGY fut fort bien accueillie parce que, différant des traités taxonomiques traditionnels, elle donnait une autre vue d'ensemble sur la structure, la croissance, les fonctions, le comportement génétique

et l'évolution des champignons. De grands progrès ont été réalisés depuis dix ans en ces divers domaines. L'auteur nous présente un texte largement revu et augmenté, avec le désir qu'il stimule encore le progrès de la mycologie. En effet, il n'est pas une page du livre où l'auteur ne mette en évidence la limite de nos connaissances actuelles ou de nouvelles perspectives de recherche. De cette manière son livre sera l'heureuse "provocation" que souhaite l'auteur. Par ailleurs, ce livre est essentiel pour un enseignement de la mycologie qui ne se veut pas purement taxonomique. Enfin il constituera pour le biochimiste et le généticien une excellente introduction au monde des champignons.

MONOGRAPHIE DES TYPHULA FR., PISTILLARIA FR. ET GENRES VOISINS, par Jacques BERTHIER, Bulletin de la Société linnéenne de Lyon, numéro spécial, septembre 1976, 114 p., 39 pl., 2 pl. col. h.t., 8°, broché, 1976. Société linnéenne de Lyon, 33 rue Bossuet, 69006 Lyon. Prix non indiqué.

L'auteur revoit l'ensemble Typhula-Pistillaria dans ses aspects morphologiques anatomiques cytologiques et cultureux et propose une classification plus naturelle des 71 espèces qu'il accepte, dont 29 ont été récoltées par lui-même en France. Son étude se base aussi sur l'examen de 60 spécimens types d'espèces, dont il a analysé l'anatomie. En effet c'est dans l'anatomie des carpophores que l'auteur trouve les caractères-clés de sa classification. Son système dépasse dès lors ceux de Bourdot et Galzin et de Corner. Le genre Typhula, qui dans sa conception stricte ne devrait plus comporter que son espèce type, T. phacorrhiza, est élargi pour comprendre en plus les sous-genres Pistillaria, Pistillina, Gliocoryne, Typhulina, Microtyphula et Cnazonaria, soit un total de 63 espèces. En outre 4 espèces de Macrotyphula, 3 de Ceratellopsis et 1 de Pterula sont décrites. Les descriptions sont méthodiques et incluent la description du carpophore (clavule, stipe, spores, basides, poils, sclérote), les caractères mycéliens et cultureux (hétérothallie, état nucléaire, germination, conidio-génie, croissance mycélienne, activité enzymatique), l'habitat, la littérature et des commentaires sur la synonymie et les affinités. Les illustrations au trait et en couleurs sont de qualité. Le lecteur ne sera pas dérouté par la minutie des caractères à observer: l'auteur lui explique et illustre les concepts anatomiques nouveaux qu'il utilise et fournit des méthodes simples d'observation. Ce travail s'impose par sa qualité, non seulement à ceux qu'intéressent les Clavariacées mais aussi à titre d'exemple d'étude monographique.

LES LACTAIRES par J. BLUM, Etudes mycologiques, vol. 3, 372 p., 94 fig., 16 pl. col., 12x18, relié, 1976. Editions Lechevalier, rue Augereau 19, Paris. Prix 90 FF.

L'auteur propose au mycophile une monographie des lactaires de France, intentionnellement basée sur les caractères macroscopiques observables sur le terrain. Les caractères microscopiques de dimension et d'ornementation des spores ne sont donnés qu'à des fins de contrôle d'identification. De cette manière, il espère attirer l'attention de l'amateur sur ce genre. Sa nomenclature suit celle de Kühner et Romagnesi plutôt que celle de Neuhoff, non qu'il rejette celle-ci mais parce qu'il juge la connaissance des lactaires encore trop fragmentaires pour qu'un accord entre les

diverses nomenclatures puisse être atteint au delà des "modes locales". 96 espèces sont décrites. 22 sont dépeintes en couleurs, quelques autres en blanc-noir.

PINE STEM RUSTS OF CANADA, par Yasuyuki HIRATSUKA et John M. POWELL, Forestry Technical Report n° 4, 104 p., 41 fig. col. et b.n., 20 cartes, 8°, broché, 1976. Department of the Environment, Canadian Forestry Service, 171 Slater Street, Ottawa. Prix non indiqué.

Des 20 espèces de rouille du Pin, cinq espèces de Cronartium et une espèce d'Endocronartium sont les causes des rouilles de la tige des Pins du Canada. Ces rouilles de la tige sont désastreuses dans la culture du Pin et en particulier du Pin blanc. Ce livre apparaît surtout comme un guide pour l'identification de ces parasites dans chacun de leurs stades de développement, grâce à une excellente iconographie. L'épidémiologie des maladies, les dommages causés et les méthodes actuelles de lutte sont brièvement exposées, suivies d'une importante bibliographie.

STUDIES ON CERCOSPORA AND ALLIED GENERA. VI. PSEUDOCERCOSPORA SPEG., PANTOSPORA CIF. AND CERCOSEPTORIA PETR., par F. C. DEIGHTON, Mycological Papers, n° 140, 168 p., 87 fig., 6 pl. broché, 1976. Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN, England. Prix £ 5.00.

L'étude de Cercospora, un des genres les plus larges des Hyphomycètes, amène l'auteur à revoir chaque espèce et la reclasser en des genres séparés, Pseudocercospora, Pantospora et Cercoseptoria. Un des critères génériques essentiels de cette ségrégation consiste dans l'épaississement de la cicatrice conidienne sur la cellule conidiogène du conidiophore. 204 nouvelles combinaisons sont établies, en plus des 24 espèces nouvelles décrites. 2 noms nouveaux sont aussi proposés.

THE GENERA OF YEASTS AND THE YEAST-LIKE FUNGI, par J. A. von ARX, L. RODRIGUES DE MIRANDA, M. Th. SMITH et D. YARROW, Studies in Mycology n° 14, 42 p., broché, 1977. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix 15 Fl.

Ce fascicule des STUDIES IN MYCOLOGY contient une importante mise à jour des genres de levures et champignons levuriformes autres que noirs. 78 genres, classés par ordre et par famille, sont revus et commentés. La synonymie, les caractères génériques, les espèces acceptées, les espèces à rejeter, les affinités intergénériques, les connections des stades parfaits et conidiens et la littérature récente sont donnés pour chacun d'eux. Les levures à asques sont classées dans les Endomycetales (familles Endomycetaceae, Ascoidaceae, Saccharomycodaceae, Saccharomycetaceae, Metschnikowiaceae, Schizosaccharomycetaceae). Les levures à affinité aux basidiomycètes forme l'ordre des Sporobolomycetales (familles Sporobolomycetaceae et Filobasidiaceae). Les levures imparfaites constituent l'ordre des Torulopsidales et la famille unique Torulopsidaceae. Dans cette dernière, le nouveau genre Selenozyma Yarrow est créé. De nombreuses combinaisons et synonymies nouvelles sont aussi établies.

CHLORIDIUM AND SOME OTHER DEMATIACEOUS HYPHOMYCETES GROWING ON DECAYING WOOD, par Walter GAMS et Vera HOLUBOVA-JECHOVA, Studies in Mycology n° 13, 99 p., 52 fig., broché, 1976. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix 30 Fl.

Douze espèces du genre Chloridium sont décrites et illustrées. Sept d'entre elles sont les stades conidiens de Chaetosphaeria. Quatre espèces de Cylindrotrichum sont décrites, une d'entre elles avec la forme parfaite Chaetosphaeria. De même quatre espèces de Gonytrichum dont deux appartiennent à Chaetosphaeria. Le Fascicule contient en outre 1 espèce de Codinaea, 2 de Exochalara, 9 de Phialophora, 3 de Chalara, 1 de Fusichalara et 2 dans le nouveau genre Phaeostalagnus W. Gams.

FUSARIUM, LABORATORY GUIDE TO THE IDENTIFICATION OF THE MAJOR SPECIES, par Colin BOOTH, Publication C.M.I., 58 p., 112 fig., 4°, broché, 1977. Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN England. Prix : £ 2.50 (U.K.), £ 3.00 (étranger).

Une heureuse initiative du Dr Booth de publier ce guide illustré pour l'identification de 29 espèces communes de Fusarium. De tous temps, l'image a été un moyen de représentation et de communication efficace. L'auteur en fait usage: les diagnoses synoptiques laissent la place aux dessins et photographies. Cependant ce guide ne serait qu'un album s'il n'y avait la clé dichotomique. Mais celle-ci est difficile: elle utilise des caractères que le débutant devra malheureusement apprendre lui-même à observer et à évaluer. La distinction entre l'ontogénie des microconidies et celles de certaines macroconidies "primaires" sur des polyphialides ou des cellules conidiogènes polyblastiques n'est pas aisée et eut mérité quelques mots d'explication et une illustration démonstrative. De même les 10 formes différentes des cellules basales ou apicales des conidies indiquées dans la clé auraient beaucoup gagné à être illustrées. Enfin l'arrangement des espèces, que l'auteur n'a pas voulu alphabétique, ne dut-il pas suivre alors celui de la clé? Il n'empêche que ce guide s'avèrera utile.

TAXONOMIC LITERATURE. A SELECTIVE GUIDE TO BOTANICAL PUBLICATIONS AND COLLECTIONS WITH DATES, COMMENTARIES AND TYPES. Vol. I: A-G. par F. A. STAFLEU et R. S. COWAN, 2e édit., 1136 p., 8°, relié toilé, 1976. Bohn, Scheltema & Holkema, Emmalaan 27, Utrecht, Nederland. Prix US \$100.00. (80.00 pour usage privé).

Ce monumental travail est le premier volume de quatre constituant une revision très élargie de l'ouvrage de F. A. Stafleu publié en 1967. Cette seconde édition comprendra un beaucoup plus grand nombre de noms de botanistes, y compris les cryptogamistes et les mycologues, qui jusqu'en 1940 ont publié 3 noms de genres au moins, et fournit pour chacun d'eux de plus amples informations: biographie, sources biographiques, éponymie (noms de genres ou de journaux basés sur le nom d'auteur), ouvrages majeurs avec dates précises de publication, herbiers et exsiccata, abréviation des noms et titres d'ouvrages. Par l'inclusion de plus nombreux mycologues, cette édition retiendra l'attention. Sans aucun doute un tel ouvrage devra se trouver à la disposition de tous.

MYCOTAXON

Vol. VI, No. 1, pp. 207-211

July-September 1977

TERMS FOR STATES AND FORMS OF FUNGI, THEIR NAMES AND TYPES

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In analyzing the nomenclature of pleomorphic imperfect fungi, Hennebert (1971) proposed the term anatomical to contrast with botanical for denoting the different systems of naming taxa of different kinds. An attempt to extend his analysis to the nomenclature of all perfect and imperfect fungi has revealed the usefulness of certain other terms, as will be seen below.

Obviously, what is called the botanical system of nomenclature is the primary system of the International Code of Botanical Nomenclature (ICBN), with botanical names applied to botanical taxa. In the context of this analysis, what is significant in the botanical system is that the ultimate unit of every botanical taxon is an "individual plant" (Art. 2, ICBN 1972). And an individual plant or organism is an organism as a whole, in all its facets, forms and potentialities, latent or expressed. For the purpose of this discussion, we shall refer to a whole organism as a holomorph (from Gk ὅλος: holos - entire).

It is holomorphs that are grouped in botanical taxa, to which botanical names apply. These names are required by the ICBN to be based on nomenclatural types, but the type of a botanical name is not necessarily a holomorph. A nomenclatural type (Art. 7) is "any constituent element ... not necessarily the most typical or representative." In the case of the name of a species, the type specimen is not necessarily a complete organism, not necessarily representing all its forms or all phases of its life cycle, nor even its most typical or characteristic parts. It may be an organism in a state of reproduction or a phase of vegetative growth, a specimen complete or incomplete, fertile or sterile, sexual or asexual. Although "the application of names of taxonomic groups is determined by means of nomenclatural types" (Principle II),

there is no intention to restrict the application of a botanical name to whatever part, form, organ or state of an organism is represented on the type specimen. The name, however typified, covers a taxon of complete organisms that make up the species, each of them similar to the individual organism that is represented, perhaps in the whole but probably only in part, by the type specimen.

The system of nomenclature of plants is a botanical system to the extent that holomorphs are the ultimate units of botanical taxa, to which botanical names are given. It is, without qualification, the system of naming non-fossil Cormophytes and Algae, so-called 'lower' fungi (Myxomycota, Mastigomycotina and Zygomycotina: see Ainsworth *et al.*, 1971), as well as lichen-forming Ascomycetes and Basidiomycetes.

As an example, we may take *Mucor mucedo* Fres., a species described as sporangial and therefore based on the sporangial state of the fungus. Its name is not thereby restricted in application to this state alone. The name covers the whole organism — the holomorph — and all organisms judged similar enough to be conspecific, even if their relationship is established on the basis of characters not seen in the type material. When Brefeld later discovered zygospores, a potentiality of the fungus originally unknown, the newly discovered form was automatically covered by the original name by virtue of its botanical application. Neither a new name or a new type was required, no more than an amplification of the known characters of the fungus species, under the botanical name typified by a sporangial state. This is the botanical system without qualification.

The botanical system is also — but with qualification — the system for naming Ascomycetes and Basidiomycetes that are not lichen-forming. That these fungi receive names of botanical application is clear in Art. 59 (ICBN 1972), where their names are described as covering "all states which are states of any one species," *i.e.*, holomorphs. But this Article makes a specification regarding the typification of these names. Unlike the type specimen of the botanical name of a holomorphic 'lower' fungus (which may bear any state or form of it), the type specimen of the name of a non-lichenized Ascomycete or Basidiomycete is required to bear evidence of sexuality if the name is to have botanical application to the holomorphic fungus. Art. 59 rules that "the ... name of all states which are states of any one species is the ... name typified by the perfect state ... which is characterized by the presence of asci ... basidia ..." etc. This characterizing form that is involved in producing meiotic diaspores may be termed the teleomorph (from Gk *τελεος*: *teleos* — having perfect achievement, being complete, adult): in Ascomycetes, an ascocarp or its equivalent, at maturity producing asci and ascospores; in Basidiomycetes, a basidiocarp or its equivalent, at maturity producing basidia and basidiospores. Hence, for an autonomous non-lichenized Ascomycete or Basidiomycete to qualify for a botanical name, teleomorphic material must be used to typify that name.

But Art. 59 also provides for the separate naming of these fungi in their asexual state. The Article makes a distinction between the nomenclature of Ascomycetes and Basidiomycetes which qualify for botanical names by virtue of their teleomorphic expression, and the naming of their asexual states and of autonomous Fungi Imperfecti, for which a non-botanical system of nomenclature is in use. This is the system referred to by Donk (1960a) as conventional and by Hennebert (1971) as anatomical. Donk (1960b), in discussing the conventional system further, re-introduced the useful term *anamorphosis* for the imperfect state, a term we shall proceed to use here for the asexual, mitotic diasporeic expression of a fungus, the form basic to the anatomical scheme.

Anatomical names are applied to anatomical categories or pseudo-taxa (Donk 1960a) whose members are parts of the anatomy of organisms instead of holomorphic organisms; *i.e.*, the ultimate unit of any anatomical taxon is a specified portion, form, or organ of an "individual plant" rather than the individual plant itself.

Thus, it is particular morphs, not holomorphs, that are grouped in anatomical taxa, to which anatomical names apply. These names, like botanical names, are required by the ICBN to be based on nomenclatural types. But in the case of the name of an anatomical species, application is not only determined by, but also restricted to, whatever part, form, state or organ is represented on the type specimen. In other words, typification and application of anatomical names coincide: the type is the unique morph that is also the ultimate unit of the anatomical taxon.

In the anatomical system governing form- and organ-genera of fossil plants (Art. 3, Note 1), the basis of a taxon is a particular kind of form or organ found in a fossil fragment; and the name is to be applied only to similar forms or organs, not to the holomorphic plant that may eventually be reconstituted from various fragments. In the form-taxa of imperfect fungi (Art. 59), the ultimate unit is a particular kind of anamorph; and the name (referring "only to the state represented by its type") is to be applied only to similar anamorphs; it is not to be applied to the holomorph that is already known — or eventually discovered — to include this anamorph, nor is it to be applied to other kinds of anamorphs. As already understood by Hughes (1953), anatomical names — by definition, typification and application — are monomorphic (Hennebert, 1971).

It is by long-standing convention that these morphs of fossils and of certain fungi are treated in an anatomical system of classification and nomenclature. But if anamorphs of non-lichenized Ascomycetes and Basidiomycetes are conventionally assigned anatomical names, should not the anatomical system be extended to cover also the names based on their teleomorphs? Certainly, if application of a name based on a teleomorph were restricted to this one sexual anatomical part of a fungus, while names based on anamorphs were restricted to single asexual forms, the several names for the same pleo-

morphic fungus could exist side-by-side without competing for priority. But then, the holomorphic fungus would be denied a botanical name.

Mycological legislators decided in favor of botanical names. In the Brussels Code of 1912, the first special rules for naming fungi established the principle that basing a name on a teleomorph makes it applicable in the botanical sense to a holomorphic fungus. Under Art. 59, the type need not be confined to the teleomorph alone, though it must include it; and the name is not restricted in application to that sexual segment of the fungus, though it undoubtedly covers it. On the contrary, although the teleomorph is a necessary component, the type may include any number of anamorphs as well; and although the name covers whatever morphs are represented in the type, it applies automatically to the holomorph in all its forms, present or not on the type specimen, and including whatever is known or remains to be discovered about the whole organism. Such a name is botanical in its full sense, applied in the same way as a name for so-called 'lower' fungi and lichen-forming Ascomycetes and Basidiomycetes. The fundamental difference between their nomenclature and that of non-lichenized Ascomycetes and Basidiomycetes is that the name of the fungi in the latter groups, when based only on anamorphs, is excluded by convention from botanical status.¹

In summary: as ruled by Article 59, the system of nomenclature for non-lichenized Ascomycetes and Basidiomycetes consists in the co-existence of two distinct systems, the

¹ In practical terms, it means that, if the type of a name for non-lichenized Ascomycetes or Basidiomycetes includes the teleomorph, the name is botanical and covers the whole fungus. If, on the other hand, the type does not include the teleomorph, the name is anatomical and restricted in application to the form represented by its type.

The Code is concerned with taxa of two kinds and consequently names of two kinds, botanical and anatomical. For most plants and fungi, the system of nomenclature is botanical. Only in the case of autonomous Fungi Imperfecti (Deuteromycetes), the mitotic states of non-lichenized Ascomycetes and Basidiomycetes, and the organs of fossil plants, is the system of nomenclature anatomical.

In the case of Ascomycetes and Basidiomycetes that are not lichen-forming, one might say that the system is "botanico-anatomical," being jointly botanical (for the entire fungus) and anatomical (for the non-meiotic state of the fungus). This kind of botanico-anatomical system of nomenclature is not at all the same system as that formulated under the same name by Hennebert (1971: 215) for imperfect fungi pleomorphic in themselves. Behind that proposal was an attempt to provide the entire imperfect phase of a fungus with a binary name of botanical effect, while retaining an anatomical monomorphic restriction for names of form-genera, which could thus serve also as terms designating monomorphic states of botanical holomorphic taxa. The relative complexity of this approach to the nomenclature of pleomorphic imperfect fungi (both autonomous and correlated) seems to us now to provide little advantage over the simplicity of the monomorphic anatomical system for form-species as well as form genera.

one for taxa of holomorphic fungi and therefore botanical, the other for form-taxa of anamorphs of fungi, treated as anatomical.

All botanical names are *nomina holomorphosium*, applying to organisms as whole beings in all their known or unknown expressions and potentialities. *Nomina holomorphosium* are normally typified by any constituent diagnosable element of the taxon (Art. 7), whether teleomorphic, anamorphic or combining all elements. This is the unqualified botanical system of nomenclature as it applies to plants, 'lower' fungi and lichen-forming 'higher' fungi. In non-lichenized Ascomycetes and Basidiomycetes, *nomina holomorphosium* (botanical names), applicable to holomorphs, are typified at the very least by their teleomorph, whereas names typified by anamorphs alone are *nomina anamorphosium* (anatomical names), and their application is restricted to the single anamorph represented by their type. Anatomical *nomina teleomorphosium* do not exist under our present Code, because a sexual form does not bear a name separate from the name of the holomorphic fungus.

Finally, a word about the Code's ruling requiring the co-existence of a *nomen holomorphosis* and *nomina anamorphosium* for the same Ascomycete or Basidiomycete. As Donk (1960b: 172) pointed out, if a choice has to be made between them, *nomina anamorphosium* automatically become *nomina rejicienda*, giving way to the priority of the *nomen holomorphosis*. Under Art. 59, holomorphic names, being botanical, are priorable; anamorphic names, being anatomical, are unpriorable except within the narrow limits of typification by similar anamorphs.

It is our contention that the terms used above bring into sharper focus the nomenclature of fungi as regulated by ICBN and its Art. 59. Their adoption can turn discussion away from arguments about the meaning of long familiar and no longer uniformly understood terms to a concentration on basic principles.

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NOTICE

IMA NOMENCLATURE MEETINGS AT IMC²

Each Subcommittee of the International Mycological Association's Nomenclature Committee will have a scheduled session at the Second International Mycological Congress, University of South Florida, to conduct face-to-face discussions of the work already begun by mail. It is to be hoped that some definitive proposals can be hammered out during those subcommittee meetings for further action by the whole Nomenclature Committee in their meetings scheduled later in the week.

Please note that in order to avoid conflicting meetings for some members who serve on more than one subcommittee, the date for some subcommittee meetings has been changed from that provisionally sent to Secretaries, and from that published in the MSA Newsletter. Meetings are open to anyone.

The following is the corrected schedule of all sessions of the Nomenclature Committee:

<u>Subcommittee Meetings</u>	<u>Date & Time</u>	<u>University Center</u>
A (Article 59)	Aug.27, 2:00 pm	Room 201
B (Living types)	Aug.30, 8:00 pm	Room 202
C (Registry, Art.39)	Aug.29, 8:00 pm	Room 202
D (Starting-points)	Aug.28, 9:00 am	Room 201
E (Infraspecifics)	Aug.30, 8:00 pm	Room 201
F (Generic names)	Aug.29, 8:00 pm	Room 201
<u>Nomenclature Committee</u> <u>(everyone!)</u>	<u>Date & Time</u>	<u>Place</u>
Subcommittee Reports	Aug.31, 5:00 pm	Gymnasium
Final Session	Sept.1, 5:00 pm	Gymnasium

MYCOTAXON

AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION
OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS

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[MYCOTAXON for July-September 1977 (6: 1-212)
was issued July 30, 1977]

ISSN 0093-4666 MYXNAE 6(2) 213-420 (1977)

Library of Congress Catalogue Card Number 74-7903

Published quarterly by MYCOTAXON, Ltd., P.O. Box 264, Ithaca NY 14850
For subscription details, see back cover

MYCOTAXON

Vol. VI, No. 2, pp. 213-214

October-December 1977

VALIDATION OF SUBCLASS CERATIOMYXOMYCETIDAE

AND

ORDER CERATIOMYXALES

(CLASS MYXOMYCETES)

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Recent taxonomic treatments of the Myxomycetes (Martin & Alexopoulos, 1969; Alexopoulos, 1973; Nannenga-Bremekamp, 1974; Farr, 1976) have employed the ordinal taxon "Ceratiomyxales" in neglect of the fact that it is not validly published.

To rectify this situation, a brief Latin diagnosis is provided here, in accordance with Article 32 of the International Code of Botanical Nomenclature.

Order Ceratiomyxales Martin ex Farr & Alexopoulos

Ceratiomyxales Martin, G. W. 1949. No. Amer. Fl. 1(1): 5. Nomen seminudum.

Ut in diagnosi cohortis "Exosporeae" Rostafinski
(=subclassis "Ceratiomyxomycetidae" Martin) descripta.

The subclass Ceratiomyxomycetidae Martin is not validly published in the work usually cited, Ainsworth,

G. C. 1961. Dictionary of the Fungi, ed. 5, p. 497. Instead, it dates from Martin & Alexopoulos (1969), where reference is made to the description of "Cohors Exosporeae" by Rostafinski. The subclass is, therefore, to be authored by Martin ex Martin & Alexopoulos.

Olive (1975) classifies these organisms in the subclass Protostelia, order Protosteliida, as family Ceratiomyxidae Schroeter, 1897.

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THE OSTROPALEAN FUNGI II: SCHIZOXYLON, with notes on STICTIS, ACAROSPORINA, COCCOPEZIZA, AND CARESTIELLA

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SUMMARY

Twenty-five species of *Schizoxylon* not discussed in a previous paper on the Ostropalean fungi (Sherwood, 1977) are treated. Eight are retained in the genus and redescribed; two are transferred to *Stictis*, one to *Acarosporina*, and eight are considered to be non-Ostropalean. Five new species of *Stictis* are described. *Carestiella* is accepted as Ostropalean and *Coccopeziza* is shown to be a later synonym of *Arthonia*. A key to all hitherto known species of *Schizoxylon* is provided.

INTRODUCTION

In a previous paper (Sherwood, 1977) I discussed the general characters of the Ostropales, and provided a key to genera and descriptions of individual genera. Only the North American species of *Schizoxylon* were treated there. In the course of investigating the non-North American species of *Schizoxylon* and unidentified material in that genus I encountered several species of *Stictis* not covered in the previous treatment. In addition I examined the types of two genera formerly assigned to the Stictidaceae, *Coccopeziza* and *Carestiella*. The results are presented below. The genera are listed in alphabetical order, and the species are listed in alphabetical order under each generic heading. Synonyms not found in the previous paper are cross-referenced. Materials and methods were identical to those described in the previous paper (Sherwood, 1977).

(1). *ACAROSPORINA* Sherwood, Mycotaxon 5: 33 (1977)

(11). *ACAROSPORINA* HORMOSPORA (Speg.) Sherwood, comb. nov.
= *Schizoxylon hormosporum* Speg., An. Soc. Ci. Argent.
10: 148 (1880)
= *Schizoxylon abutilonis* Cash, Mycologia 30: 97 (1938)

Figure 1

1. Present address: Farlow Herbarium, Harvard University, Cambridge, Mass. 02138 USA.

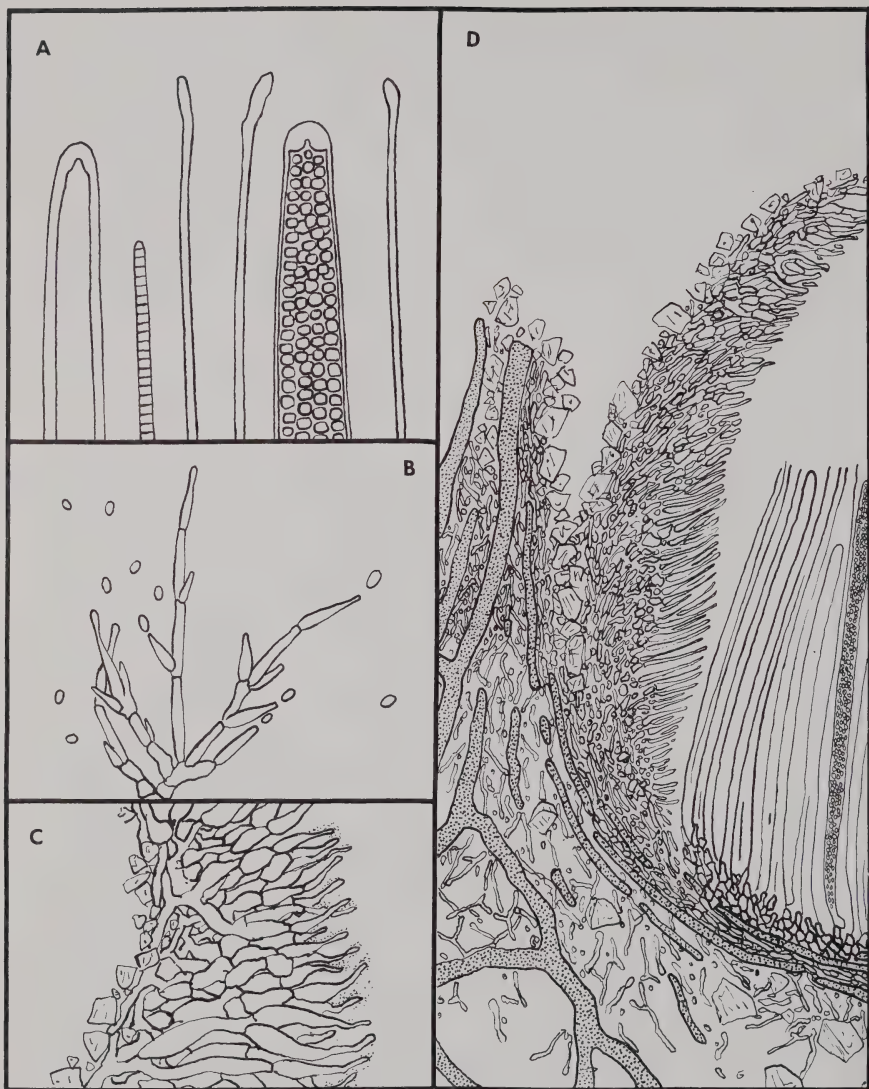


Figure 1. *Acarosporina hormospora*. A. Detail of apices of asci, paraphyses, and spores, and part-spores, x1500. B. Imperfect stage? x750. C. Detail of upper periphysoids, x750. D. Cross section of margin, x300. Drawn from the holotype of *Schizoxylon abutilonis*.

Apothecia at first immersed, opening by a pore and finally becoming partially erumpent, densely gregarious, often clustered, 0.3-1.0 mm broad, with an annulate margin, remaining for a long time covered by a dark grey-pruinose peridium, opening by a pore (rarely by a transverse slit), the disc deeply immersed, pale ochraceous, splitting away

from the margin when dry. Margin in cross section predominantly periphysoidal (as in *Stictis* sect. *Lichenopsis* [Schw.] Sherw.), lacking a distinct internal crystalline layer, the wall 25-30 μm thick, somewhat gelatinous, of interwoven colorless hyphae 1.5-3.0 μm diam., crystalliferous in the upper part and splitting away from the substrate. Upper periphysoids brown, 30-40 x 3-4.5 μm , not gelatinous, branched, forming a compact layer. Lower periphysoids 30-40 x 1.5 μm , simple to sparingly branched, colorless. Subhymenium colorless, 5-10 μm thick. Asci and paraphyses apices J+ blue. Paraphyses filiform, colorless, 1.0 μm diam. below, scarcely enlarged above, simple. Asci 150-200 x 4-5(-7) μm , the cap 2.5 μm thick, with a narrow pore. Spores 8, 1.2 μm diam., at first septate with cells 1.0 μm long, breaking up into cubical or globose part-spores 1.2 μm diam.

On woody plants, associated with cankers, Hawaii and Argentina. The Hawaiian specimen has sporodochia producing unicellular colorless phialospores associated with it. This is unlike the pycnidial stages associated with other species of *Schizoxylon* and is probably a different fungus. Except that the apothecia in Spegazzini's collections are smaller (0.3-0.6 mm) than those of the type of *S. abutilonis*, I find no character to separate the two species.

SPECIMENS EXAMINED: OCEANIA: Hawaii (BPI, on *Abutilon molle*, N. Honolulu, Shear & Stevens 551, 18.I.1928, holotype of *Sch. abutilonis*). SOUTH AMERICA: Argentina (LPS 28218, on *Populus italica*, Buenos Aires, 16.V. 1880, holotype of *Sch. hormosporum*; LPS 38650, La Plata, VIII.1900, Spegazzini).

(2). *CARESTIELLA* Bresadola, Malpighia 11: 274 (1897)

(1). *CARESTIELLA* *SOCIA* Bres. , l.c.

Figure 2

Apothecia at first immersed in decorticated wood, becoming partially erumpent, 0.5-1.0 mm diam., the margin narrow, black, entire, lacking crystals, the disc moderately deeply immersed, black, not splitting away from the margin when dry. Margin in cross section c. 120 μm thick, the outermost portion of tightly compacted dark brown hyphae 1.5-3.0 μm diam., the inner portion of widely-spaced, inward-pointing, branched interwoven hyphae with free ends. Paraphyses filiform, slightly longer than the asci, 1.0 μm diam. below, the apices enlarged to 2-3 μm ; brown, J+ blue, forming an epithecium. Marginal paraphyses brown along their entire length, in an agglutinated layer 2-3 cells thick. Subhymenium c. 30 μm thick, of somewhat loosely-packed cells 2-3 μm diam., resting on an obscure pale brown continuation of the wall, the substrate beneath invaded by hyphae but barely compressed. Asci 90-110 x 11(-15) μm , very thick-walled when young, appearing bitunicate but without a demonstrable jack-in-the-box mechanism, the cap 2-2.5 μm thick, with a broad pore. Spores ultimately 32/ascus, 36-45 x 2.0 μm , colorless (pale brown when old and shrivelled), slightly curved, multiseptate, the cells 4-7 μm long.

On wood, Italy. Known only from a fragmentary type collection. The material I examined was fully mature and it

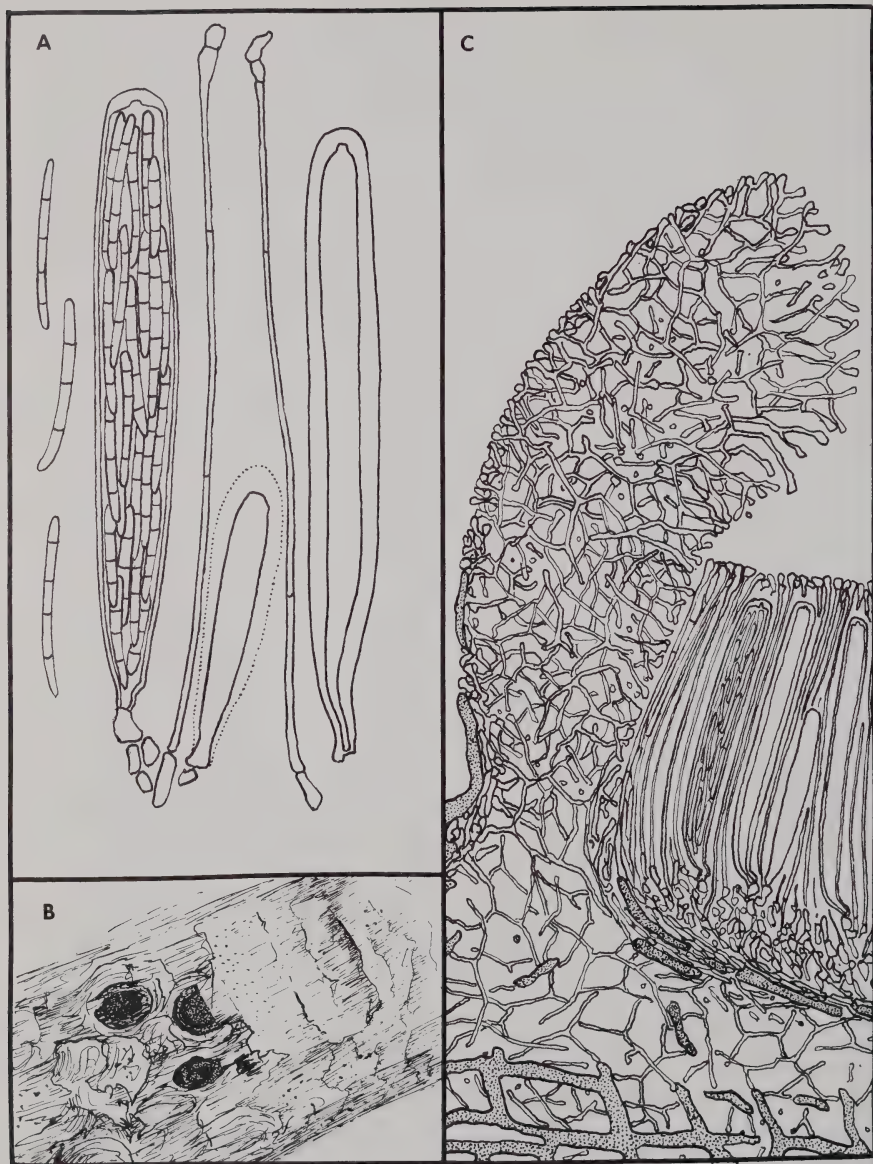


Figure 2. *Carestiella socia*. A. Asci, paraphyses, and spores, x750. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

was unclear whether the asci were initially polysporous or whether the polysporous condition arises from disarticulation of filiform spores. The external appearance of the species and the structure of the margin and asci recall *Stictis*

schizoxylodes Ell. & Ev. *Carestiella*, a monotypic genus based on *C. socia*, would appear to be a distinct genus of the Ostropales, differing from *Schizoxylon* in its marginal structure and from *Stictis* in marginal structure and polysporous asci. Although the margin separates readily from the hymenium when mounted for microscopic observation it does not do so in the dried material. The margin of *C. socia* may be more flexible than in most species of *Stictis*.

SPECIMEN EXAMINED: EUROPE: Italy (S, herb. Bresadola, holotype of *Carestiella socia*)

- (3). (*COCCOPEZIZA*) Hariot & Karsten, Rev. Mycol. (Toulouse) 12: 128 (1890)

= *Arthonia* Ach., Neues J. Bot. 3(3): 3 (1806)

The type specimen of the holotype species, *C.*

oothera Har. & Karst., is an *Arthonia* with unequally 2-celled spores $15 \times 4.5 \mu\text{m}$, perhaps *A. galactites* (DC) Duf., which occurs on *Populus* and has spores of these dimensions.

SPECIMEN EXAMINED: EUROPE: France (H, Gallia, in cortice levi *Populi albae*, c, 1890, leg. P. Hariot Det. P. A. Karsten 1623, presumed holotype of *Coccopeziza oothera*).

- (4). *SCHIZOXYLON* Pers., Ann. Wetterauischen Ges. Gesamnte Naturk. 2: 11 (1810)

The nomenclature, generic characters, and North American species of *Schizoxylon* were treated in a separate paper (Sherwood, 1977). The remaining, non-North American species are treated here. All known species are uncloned in the key; page references are provided for those species treated in the previous publication ("OF 1"). Additional records and synonyms are provided for some of these species.

Accepted and excluded species are listed in alphabetical order. Excluded species are enclosed in parentheses.

KEY TO SPECIES OF SCHIZOXYLON

1. Apothecia developing beneath a clypeus, at maturity surrounded by a massive stromatic involucre (subgen. *Stromatostropa*). *Schizoxylon emergens*
- 1'. Apothecia without an obvious clypeus or stromatic involucre, although sometimes with a fairly prominent thalline margin (subgen. *Schizoxylon*) (2)
 - 2(1'). Part-spores 4-seriate or less than 4-seriate in the mature ascus (asci 4-spored or spores much shorter than the ascus) (3)
 - 2'(1'). Ascospores and part-spores more than 4-seriate in the ascus (Asci 8-spored; spores nearly as long as the asci) (6)
- 3(2). Part-spores globose, $3.5-5 \mu\text{m}$ diam. *S. juniperinum* OF 1: 126
- 3'(2). Part-spores cylindrical (4)
 - 4(3'). Part-spores $5-7 \mu\text{m}$ broad. *S. crassispurum* OF 1: 121

- 4'(3'). Part-spores 3-3.5 μm broad (5)
- 5(4'). Marginal hyphae brown. Margin not exceeding 75 μm in thickness. *S. compositum* OF 1: 119
- 5'(4'). Marginal hyphae colorless. Margin 200-300 μm broad. *S. crassum* OF 1: 124
- 6(2'). Ascospores not regularly disarticulating (7)
- 6'(2'). Ascospores regularly disarticulating into simple or septate part-spores (17)
- 7(6). Asci not over 150 μm long; ascospores 5 μm broad. *S. pseudocyanosporum*
- 7'(6). Asci over 150 μm long; ascospores less than 3 μm broad (8)
- 8(7'). Marginal hyphae brown (9)
- 8'(7'). Marginal hyphae colorless (12)
- 9(8). Apothecia white, grey, or yellow-pruinose. Asci over 300 μm long (10)
- 9'(8). Apothecia black, shining, not pruinose. Asci 250-300 μm long. *S. lantanae* OF 1: 129
- 10(9). Ascospores 450-500 x 1.0-1.2 μm . Margin bright yellow. *S. sulfurinum* OF 1: 138
- 10'(9). Ascospores 400 μm long or less; margin grey-pruinose (11)
- 11(10'). Ascospores 1.5-2.0 μm broad. Margin not notably gelatinous. *S. alboatrum* OF 1: 111
- 11'(10'). Ascospores 2.0-2.5 μm broad. Margin very thick and gelatinous. *S. pachychlamydatum*
- 12(8'). Paraphyses apices brown, J+ or J-. *S. cordobensis* OF 1: 121
- 12'(8'). Paraphyses apices colorless, J- (13)
- 13(12'). Ascospores 2.5-3.0 μm broad (14)
- 13'(12'). Ascospores 1.0-2.0 μm broad (15)
- 14(13). Ascus cap 2.0 μm thick, indistinct. Apothecia very large (up to 3 mm diam.) *S. gigas*
- 14'(13). Ascus cap 7.5 μm thick. Apothecia c. 1 mm diam. *S. pallescens*
- 15(13'). Asci 600-700 μm long. Apothecia often taller than broad. *S. andinum*
- 15'(13'). Asci 500 μm long or less (16)
- 16(15'). Ascospores 300-500 x 2.0 μm . Disc pruinose, plane. North America. *S. melleum* OF 1: 131
- 16'(15'). Ascospores 300-350 x 1.75 μm ; disc epruinose, concave. South Africa. *S. bellum* OF 1: 113
- 17(6'). Asci more than 300 μm long (18)
- 17'(6'). Asci less than 300 μm long (21)
- 18(17). Asci 500 μm long. Margin black, carbonized. (*S. broteriana*, an imperfectly known species, will also key here). *S. involutum* OF 1: 126
- 18'(17). Asci 300-350 μm long. Margin thin, colorless (19)
- 19(18'). Apothecia with a distinct stellate margin. *S. floridanum*
- 19'(18'). Apothecia with an entire margin (20)
- 20(19'). Part-spores 2.0 μm broad. Africa. *S. pruiniferum* OF 1: 137
- 20'(19'). Part-spores 2.5-3.5 μm broad. North America. *S. schweinitzii*

- 21(17'). Part-spores septate (22)
 21'(17'). Part-spores unicellular (27)
 22(21). Part-spores 1-septate (23)
 22'(21). Part-spores multiseptate (26)
 23(22). Part-spores 2-2.5 μm broad.
 S. berkeleyanum OF 1: 115
 23'(22). Part-spores more than 3 μm broad (24)
 24(23'). Hymenium intensely J+ blue (25)
 24'(23'). Hymenium J-. Minute graminicolous species
 with a very reduced margin. *S. pratense*
 25(24). Asci without a distinguishable apical cap.
 S. compositum OF 1: 119
 25'(24). Asci with a distinct apical cap 2.5 μm thick,
 S. centauryae
 26(22'). Part-spores 3-5 septate.
 S. microstomum OF 1: 134
 26'(22'). Part-spores 10 or more septate.
 S. buriticae OF 1: 117
 27(21') Asci 15-18 μm broad. Part-spores more than 8-
 seriate. *S. nigrellum* OF 1: 134
 27'(21'). Asci 6-14 μm broad. Part-spores 8-seriate (28)
 28(27'). Epithecium intensely J+ blue (29)
 28'(27'). Epithecium J- (34)
 29(28). Part-spores globose or cubical, isodiametric (30)
 29'(28). Part-spores cylindrical (31)
 30(29). Part-spores globose. Argentina.
 S. taenioides
 30'(29). Part-spores cubical. Australia.
 S. lividum
 31(29'). Part-spores 3-4 μm broad (32)
 31'(29'). Part-spores less than 3 μm broad (33)
 32(31). Margin greenish or yellowish, KOH+ yellow.
 S. compositum OF 1: 119
 32'(31). Margin pale brown, KOH-. *S. argentinum*
 33(31'). Asci 100-140 μm long. *S. henningsianum*
 33'(31'). Asci 180-200 μm long.
 S. berkeleyanum var? OF 1: 115
 34(28'). Part-spores 3-3.5 μm broad; ascocarps fleshy
 when moist. *S. ligustri* OF 1: 129
 34'(28'). Part-spores 2.5 μm broad; ascocarps carbon-
 ized. *S. sepincola* OF 1: 138

INCLUDED AND EXCLUDED SPECIES OF SCHIZOXYLON

- (1). (*SCHIZOXYLON ABUTILONIS*) see *Acarosporina hormospora*
 (2). *SCHIZOXYLON ALBO-VELATUM* Rick, Broteria 3: 289 (1904)

According to the original description this Brazilian species had erumpent apothecia 2 mm broad, with a grey-white margin and colorless disc, asci 800 x 14 μm , and ascospores 4 μm broad which disarticulated to form 1-septate part-spores which subsequently disarticulated to form simple part-spores 8 μm long. Paraphyses were said to be branched and longer than the asci. I received no answer to inquiries for type material of this species. According to Rick (l.c.)

the species might have been referred to *Robergea* Desm. and resembled *Schizoxylon* only in possessing disarticulating spores. The description of a fungus with an exposed hymenium, branched paraphyses, and an ascocarp considerably broader than tall suggests *Schizoxylon* rather than *Robergea*. The species should be recognizable if recollected.

- (3). (*SCHIZOXYLON ALNEUM*) Feltgen, Vorstud. Pilzfl. Luxemburg suppl. 2: 90 (1901)
= *Vibrissea filisporia* (Bon.) Korf & Sánchez, J. Agric. Univ. Puerto Rico 51: 85 (1967), according to A. Sánchez (note with specimen).

SPECIMEN EXAMINED: EUROPE: Luxemburg (FH-Hönnel A4659, an *Alnus*-Zw., Schimpach, 9.1900, Feltgen, isotype of *S. alneum*)

- (4). *SCHIZOXYLON ANDINUM* Patouillard, Bull. Soc. Mycol. France 11: 220 (1895)

Figure 3

Apothecia at first immersed, becoming partially erumpent, 0.5-0.8 (-1.0 fide Patouillard) mm diam., nearly a millimeter tall (generally taller than broad), orbicular in face view, reddish-brown pruinose, somewhat darker towards the center, without an exposed disc, defined slit, or ostiole. Margin in cross section entirely colorless, without a prominent accessory thalline margin, 10-20 μ m broad below, enlarged to 100-150 μ m above, the hyphae 1.5-2.5 μ m diam.; crystals scattered, non-rosettiform, not forming a distinct layer. Periphysoids absent. Asci 600-700 x 8-10 μ m, strictly cylindrical, thick-walled when young, the cap 2.0 μ m thick. Paraphyses numerous, filiform, J- throughout, colorless, sometimes branched and slightly swollen at the apex, not forming an obvious epithecium. Ascospores 8, nearly as long as the asci, 2.5-3.0 μ m broad, the cells 4-6 μ m long, not sheathed, coiling, or disarticulating.

On wood, Ecuador. The type specimen appears to be slightly immature, as the margin is still closed above the hymenium. It is possible that this is an *Ostropa* Fr. rather than a *Schizoxylon*; superficially it appears rather similar to *O. cinerea* (Pers.) Fr. var. *virens* (Otth) Sherw.

SPECIMEN EXAMINED: SOUTH AMERICA: Ecuador (FH-Patouillard 5009, Pululahua, sur brindille de bois pourri, Lagerheim, holotype of *Schizoxylon andinum*)

- (5). *SCHIZOXYLON ARGENTINUM* Speg., An. Soc. Ci. Argent. 9: 186 (1880)

Figure 4

Apothecia at first immersed, opening by a pore and at length becoming somewhat erumpent, 0.5-0.75 mm diam., the margin raised, white to pale brown, strongly pruinose, the disc tan, pruinose, concave, not splitting away from the margin when dry. Margin in cross section c. 30 μ m thick, of colorless interwoven hyphae 1.5 μ m diam., becoming pale brown near the apex, surrounded by a prominent, predominantly crystalline thalline margin. Subhymenium colorless, 10 μ m thick, resting on a prominent crystalline layer, J-. Asci

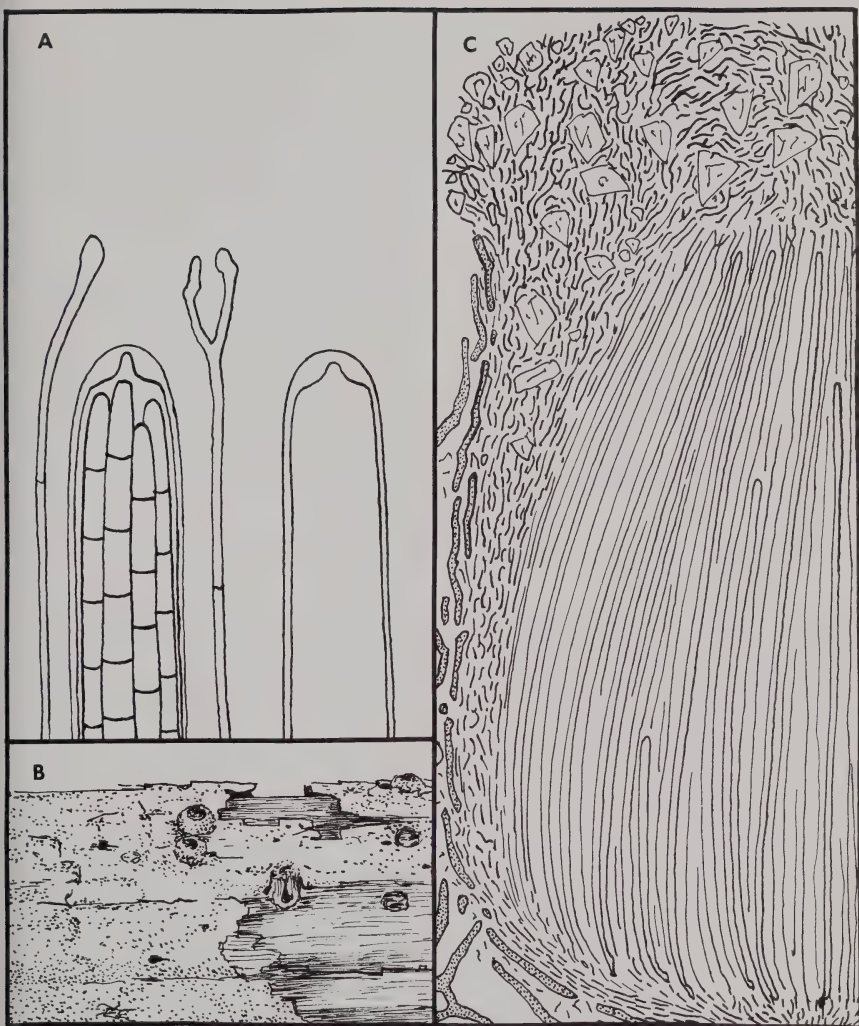


Figure 3. *Schizoxylon andinum*. A. Detail of apices of asci, paraphyses, and spores, xl500. B. Habit sketch, x7.5. C. Cross section of margin, xl50. Drawn from the holotype.

220-250 (-300 fide Spegazzini) x 8-9(-15) μm , the cap 3.0 μm thick, pierced by a broad pore, not distinct. Paraphyses filiform, 1.0 μm broad below, brown above, much-branched but scarcely enlarged at the apex, abundantly crystalliferous. Ascospores 8 (sometimes fewer), nearly as long as the asci, soon breaking apart into segments 5-8 x 3-4 μm .

On wood, Argentina. The type collection contains only a few fertile apothecia and was evidently rather old when collected. Both the original description and the type-

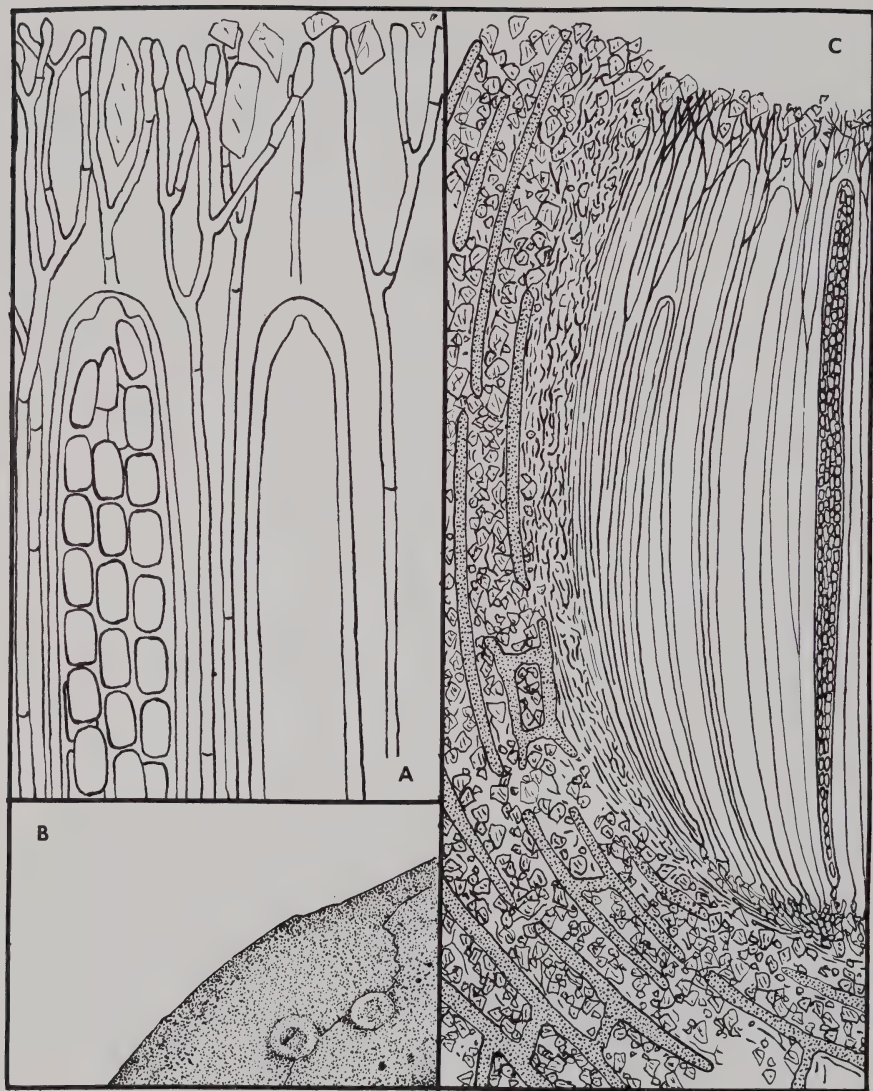


Figure 4. *Schizoxylon argentinum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

written label on the packet list the host as *Bauhinia*, but Spegazzini's handwritten label inside the packet lists the host as *Robinia pseudacacia*. There seems to be only one species of *Schizoxylon* in the packet. Spegazzini gives the measurements of the asci as "300 x 15-20 μ " and the part-spores as "10-12 x 5 μ ". Perhaps he examined abnormal asci.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28214, s/ *Bauhinia aculata*, Buenos Aires, La Recoleta, II-1880, holotype of *S. argentinum*)

(6). *SCHIZOXYLON ASPHODELII* see *S. centauriae*

(7). *SCHIZOXYLON BAGNISIANUM* see *S. ligustri*

(8). (*SCHIZOXYLON BAMBUSINUM*) Speg., Bol. Acad. Nac. Ci. 11: 588 (1889)

The type specimen contains a few apothecia of a *Stictis*, probably *S. stellata* Wallr. (I did not examine it microscopically). The apothecia with a dark disc, asci 45-50 x 8-9, spores 2 x 1 1/2, chlorino-oliv. of Spegazzini's description would most plausibly appear to be a parasite in the hymenium of this *Stictis*. It consists of pads of stromatic tissue with vertically-oriented hyphae (not paraphyses), brown near the surface and hyaline within, containing pockets of innumerable brown spores of the dimensions ascribed to them by Spegazzini. This is definitely no *Schizoxylon*. If it is an Ascomycete at all the asci have completely disintegrated.

SPECIMEN EXAMINED: SOUTH AMERICA: Brazil (LPS 28213, Apiaty, Puiggari 2386, holotype of *S. bambusinum*)

(9). *SCHIZOXYLON BERKELEYANUM* (Dur. & Lév.) Fckl. (OF 1: 115)

Sphaeria xantholeuca Fr., cited as a possible synonym by Sherwood (1977), is typified by a fungus consisting of translucent, flesh-colored, orbicular erumpent fruitbodies with obscure hairlike appendages and no obvious ostiole. It is definitely not a *Schizoxylon* and is probably Tuberculariaceous. The genus *Sphaerolima* Fckl., based on this species, should not be considered a synonym of *Schizoxylon*.

SPECIMEN EXAMINED: EUROPE: Switzerland (UPS, Herb. Fries, caule *Epilobii*, ex Helveti, apparent holotype of *Sphaeria xantholeuca*)

(10). *SCHIZOXYLON CENTAURIAE* Bres., Atti R. Acc. Sci., Lett. Arti Agiati Roverto 8: 135 (1902)

= *S. asphodelii* Maire, Bull. Soc. Mycol. France 46: 239 (1930)

Figure 5

Apothecia at first immersed, soon becoming strongly erumpent, 0.5-1.5 mm diam., the margin thick, entire, white-pruinose with a faint yellowish or greenish tinge, KOH+ yellow, the disc dark grey, strongly white-pruinose, not depressed. Margin in cross section c. 100 μ m thick above, narrower below, of interwoven, crystalliferous, slightly gelatinous pale brown hyphae 2.0 μ m diam. Accessory thalline margin inconspicuous. Subhymenium colorless, c. 50 μ m thick, J-, resting directly on disintegrating host tissue. Asci 250 x 9(-11-12) μ m, 8 or fewer per ascus (rarely 4), soon breaking up into part spores which are 5-7 x 3-3.5 μ m, rarely longer and 2-3 septate. Paraphyses J+, 1.0 μ m broad below, enlarged to 1.5-2 μ m at the apex, branched, brown, slightly crystalliferous, forming an epithecium 75 μ m thick.



Figure 5. *Schizorylon centauriae*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section on margin, x300. Drawn from the holotype of *S. centauriae*.

On stems of *Centauria*, Portugal, and *Asphodelus*, Greece. The species is similar to *S. compositum* Ell. & Ev., but has a thicker margin and distinct ascus cap. According to Bresadola (l.c.) the asci were 340-360 μm long. I could find no asci longer than 250 μm in his material. Perhaps the very thick epithecium was included in measurements of the asci.

SPECIMENS EXAMINED: EUROPE: Portugal (S, herb. Bresadola, in caulibus *Centauriae sempervirentis*, Setubal, Torrend, holotype of *S. centauriae*). Greece (MPU, Maire 3938, in caulibus aridis *Asphodeli messeniaci* pr. Manoladka, Elidis 5.V.1908).

(11). *SCHIZOXYLON COMPOSITUM* Ell. & Ev. (OF 1: 119)

As indicated in the key, the ascospores in this species are sometimes 4-seriate and sometimes 8-seriate, not invariably 4-seriate as was implied by the earlier paper (Sherwood, 1977).

(12). *SCHIZOXYLON CORDOBENSIS* (Speg.) Sherwood (OF 1: 121)
= *Schizoxylon tenuisporum* Speg., Bol. Acad. Nac. Ci.
29: 164 (1926)

The two epithets were published simultaneously. Having redescribed and accepted the species under the epithet *cordobensis* I would prefer retaining that name. The species is evidently widespread in warm climates; several additional records are reported here.

SPECIMENS EXAMINED: OCEANIA: Hawaii (BPI, on *Lantana*, Shear & Stevens 553, 11.XII.1927, reported by Cash (1938) as *S. insigne* (de Not.) Rehm). NORTH AMERICA: USA (BPI, Key Largo, Florida, Shear 1261, 16.XII.1938; Alabama, on *Ligustrum*, Carver 10.VI.1932). SOUTH AMERICA: Argentina (LPS 28221, s/ *Vachelia farnesiana*, Cordoba II-1925, C. Bruch, holotype of *S. tenuisporum*).

(13). (*SCHIZOXYLON CORTICOLUM*) (Fr.) Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 197 (1855)
= *Coniangium corticolum* Fr., Summa veg. scand. sect. prior. 121 (1846)
= *Bactrospora corticola* (Fr.) Almq.; Om de skandin. artern. slägt. Schismatomma, Opegrapha, och Bactrospora 25 (1869)
= *Lecanactis corticola* (Fr.) Lett., Repert. Spec. Nov. Regni Veg. Beih. 69: 26 & 42 (1932)

For additional synonyms see Zahlbruckner (1922-24). The species is based on a specimen, originally identified by Fries as *Lecidea dryina* (Ach.) Ach. and issued under that name in Lichenes Scandinaviae, but later redescribed by Fries as a distinct species, *Coniangium corticolum*. Nylander (1861) agreed that Fries's species was distinct from Acharius's, provided brief descriptions of the microscopic characters of both, and concluded that they belonged in *Schizoxylon*. *L. dryina* and *S. corticola* are sometimes placed in a distinct genus, *Bactrospora* Massal., synonymized with *Lecanactis* Eschw. by most current authors. Judging from the material in Nylander's herbarium, *S. corticolum* is indeed a species of *Lecanactis*, distinguished from *L. dryina* by a J-hymenium and cubical part-spores. A distinct lichen thallus, obviously bitunicate asci, superficial habit and well-developed excipulum readily separate this species from *Schizoxylon*.

SPECIMEN EXAMINED: EUROPE: Great Britain (H, Herb. Nylander 4731, New Forest, Crombie 1867).

- (14). (*SCHIZOXYLON DRYINUM*) (Ach.) Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 197 (1855)
 = *Lichen dryinus* Ach., Lichenogr. Suec. Prodrum. 16 (1798)
 = *Lecidea dryina* (Ach.) Ach., Method. Lich. 34 (1803)
 = *Bactrospora dryina* (Ach.) Massal., Ricerch. Auton. Lich. 133 (1852)
 = *Lecanactis dryina* (Ach.) Lett., Repert. Spec. Nov. Regni Veg. Beih. 69: 26 & 45 (1932)

Additional synonyms are given by Zahlbruckner (1922-24). The species is evidently a *Lecanactis*, distinguished from *L. corticola* by the J+ reaction of the hymenium and cylindrical part-spores. Some authors (cfr. Poelt, 1969) have hesitated to ascribe the species to Acharius, but the fragment of the type which I examined agrees with the concept of Nylander and later authors.

SPECIMENS EXAMINED: EUROPE: Sweden (S, Magnusson, Swedish Lichens 531, on *Quercus*, 12.8.1948) (H, herb. Acharius, "Suecia", presumed holotype of *Lichen dryinus*). Finland (H, herb. Nylander 4729, on *Quercus*). Germany (S, Rabenhorst, Lichenes Europaei 617, on *Quercus*, Münster)

- (15). *SCHIZOXYLON* (*STROMATOSTROPA*) *EMERGENS* Sherwood, subgen. et spec. nov.

Figure 6

STROMATOSTROPA Sherw., subgen. nov.

Apothecia primum clypeo stromatico oblecta, postea erumpentia et submersa in verrucis stromaticis superficie fusca carbonacea hyphas tenuis in gelatina rare dispersas continente praeditis. Periphysioidea et strata crystallina definite nulla. Asci elongate cylindrici, sporis filiformibus, achromis, multiseptatis. A subgenere typico matrice stromatica continente distinctum.

Apothecia at first covered by a stromatic clypeus, later erumpent and immersed in stromatic warts with a dark carbonized surface surrounding slender hyphae widely spaced in a gel. Periphysoids and well-defined crystalline layers absent. Asci long-cylindrical; spores filiform, colorless, multiseptate. Distinguished from *Schizoxylon* subgen. *Schizoxylon* by the stromatic matrix surrounding the apothecium.

Holotypus: *Schizoxylon emergens* Sherw.

SCHIZOXYLON EMERGENS Sherw., spec. nov.

Apothecia in verrucis erumpentibus nigris stromaticis submersa, 0.4-1.5 mm diam., margine griseo-pruinoso, disco punctiformi, non depresso, nigro. Stroma c. 200 µm crassum, externe nigrum, interne ex hyphis achromis minus quam 1.0 µm diam., in gelatina submersis consistans. Paries ca. 40 µm crassus, ex hyphis infra achromis 1.5 µm diam., supra brunneis 2-3 µm diam. consistens. Paraphyses 500-525 x 1.0 µm, apice brunneo ad 1.5-2.0 µm incrassatae, in iodo non caerulescentes. Asci 450-500 x 7-8 µm, apice 4 µm crassi, 4- vel 8-spori. Sporae 450-475 x 2.0 µm, septatae, cellulis 4-6 µm longis.

In caulibus herbaceis emortuis, ad elevationes altas in Andibus montibus.

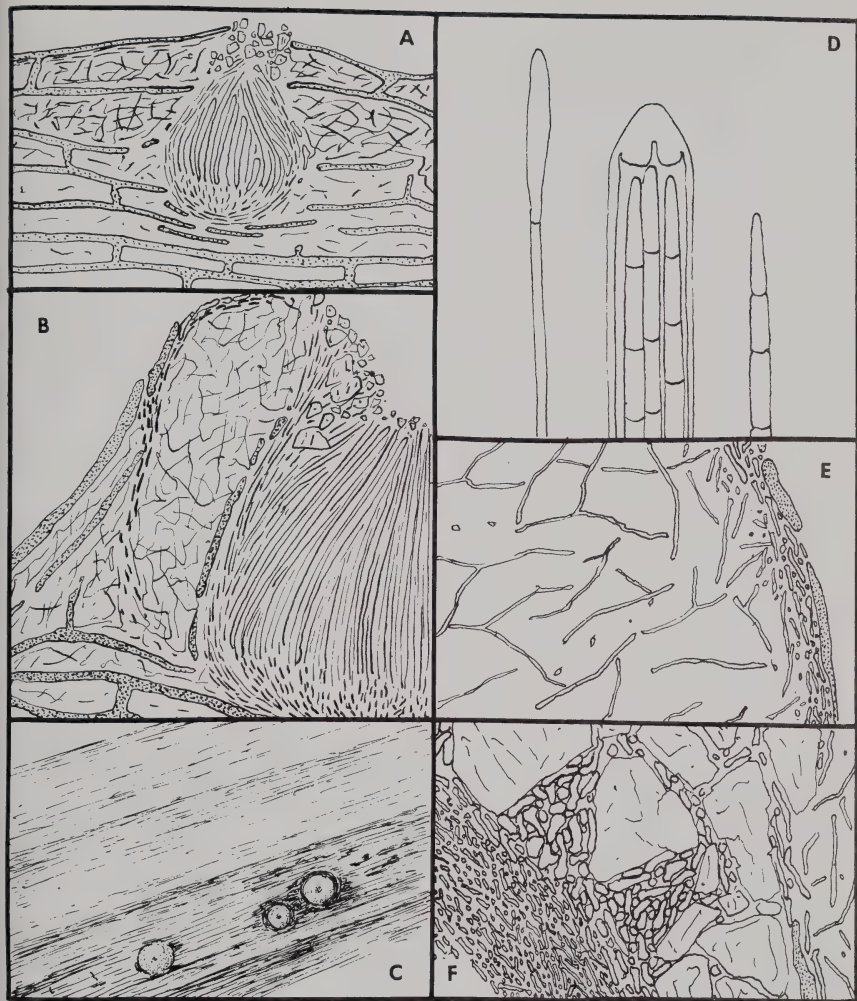


Figure 6. *Schizoxylon (Stromatostropa) emergens*. A. Early stage in ascocarp development, x75. B. Later stage in ascocarp development, x75. C. Habit sketch, x7.5. D. Detail of apices of an ascus, paraphyses, and spores, x1500. E. Outer face of stromatic involucrum, x750. F. Summit of wall, x750. Drawn from NY-Co 8014.

HOLOTYPE: COL-Dumont 8014, vicinity of km post 53 on the Rio de Paz-Chita-La Uvita road, Dpto. Boyacá, Colombia, elev. ca. 11,000 ft. K. P. Dumont, P. Buriticá, M. I. Umaña. 15 September 1976. ISOTYPUS: NY

Apothecia at first completely immersed, with a distinct, gelatinous, stromatic clypeus surrounding the developing fruitbody, later erumpent, orbicular in outline, tough, black, shining, with an orbicular, non-depressed, grey-

pruinose disc, often with a darker center, appearing pyrenomycetous. The pyrenomycetous aspect of the perithecium is the result of being entirely immersed in a stromatic mass. Accessory thalline margin deriving from the clypeus present earlier in development, c. 200 μm thick, with an outer layer 20-25 μm thick of hyphae tightly cemented in brown amorphous matter and an inner layer of colorless hyphae less than 1.0 μm diam. widely spaced in a gel. Wall c. 40 μm thick, separated from the stromatic thalline margin by a layer of compressed host tissue and crystals, composed of tightly-packed colorless hyphae 1.5 μm diam. below, of dark brown. crystalliferous hyphae 2-3 μm diam. above. Subhymenium c. 70 μm thick, colorless, resting directly on disintegrating host tissue. Asci 450-500 x 7-8 μm , 4 or 8-spored, the cap 4 μm thick. Paraphyses numerous, filiform, 1.0 μm broad, enlarged to 1.5-2.0 μm at the apex, pale brown, J-. Ascospores nearly as long as the asci, 2.0 μm broad, not sheathed or coiling, septate, the cells 4-6 μm long, not disarticulating.

On herbaceous stems, Colombia and Peru.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Colombia (NY-Co 6114, Dto. Antioquia, Dumont, Carpenter, Sherwood, 12.VIII.1976; Co-6129, *Ibid.*; Co-6122-a, *Ibid.*; Co-8145, Dto. Cundinamarca, Dumont, Buriticá, Umaña, 17.IX.1976). Peru (NY-Pe 1937, Dto. Cuzco, Dumont, Buriticá, Carpenter, Sherwood, 19.VII.1976).

(16). SCHIZOXYLON FLORIDANUM Sherwood, spec. nov.

Figure 7

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.3-0.8 mm diam., margine lacerato, albo, disco albo. Margo in sectione transversali 30 μm crassus, siccus ab hymenio se non abrumpons, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, apice non incrassatae, pallide brunneae, in iodo non caerulescentes. Asci 290-320 x 6.5-7.5 (-9) μm , apice 2 μm crassi, 8-sporei. Sporae 250-300 x 2.0 μm , cellulis 5-7 μm longis, ad septa se disjungentibus et articulos simplices formantibus.

HOLOTYPE: BPI-Shear 1270, on *Magnolia*, Oveido, Florida, USA, Feb. 4 1940

Apothecia at first immersed, opening by a pore and becoming slightly erumpent, 0.3-0.8 mm diam., the disc plane or slightly raised, white or pale grey, pruinose, the margin white-pruinose, stellate, not splitting away from the disc when dry. Margin in cross section 30 μm broad below, 75 μm broad above, of interwoven colorless hyphae 1.0 μm diam., eventually covered with numerous small colorless crystals. Subhymenium colorless, c. 50 μm thick, J-. Asci 290-320 x 6.5-7.5 (-9) μm , the cap 2 μm thick, not distinct. Ascospores 8, nearly as long as the asci, 2.0 μm broad, disarticulating at the septa to form unicellular part-spores 5-7 μm long. Paraphyses filiform, branched apically but scarcely enlarged, pruiniferous, pale brown at the apex, J-, forming an epithecium 20 μm thick.

On wood and bark, southeastern USA. *Sch. pruiniferum* Sherw. is completely colorless, and has a thicker ascus cap and poorly-defined margin. *Sch. alboatrum* Rehm has a thicker ascus cap, longer asci, a brown margin, and non-disartic-

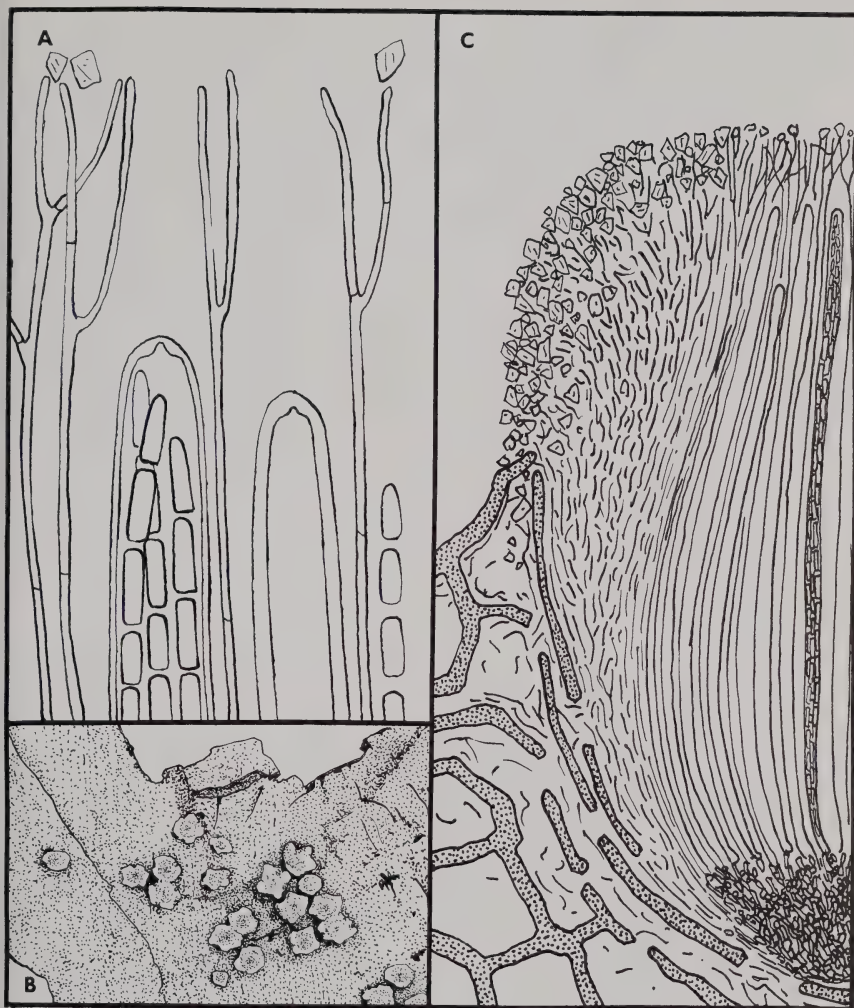


Figure 7. *Schizoxylon floridanum*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype.

ulating spores.

SPECIMEN EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, on *Fraxinus*, Shear, 23.I.1943).

(17). *SCHIZOXYLON GAUBAE* see *S. lividum*

(18). *SCHIZOXYLON GIGAS* Speg., An. Mus. Nac. Ci. Hist. Nat. Buenos Aires 19: 456 (1909)

Apothecia at first immersed, becoming strongly erumpent and at length nearly superficial, orbicular, approximately 2 mm broad, with a thick, pale-brown, pruinose margin and convex reddish-pruinose disc. Margin in cross section c. 200 μm thick, of loosely interwoven hyphae 1.5 μm diam., colorless, not notably gelatinous, with numerous small non-rosettiform crystalline inclusions. Paraphyses filiform, 500 x 1.0 μm , branched at the apex and enlarged to 1.5 μm , colorless, forming an epithecium 150 μm thick.

All of the asci in my microscopic preparations were extremely immature. According to Spegazzini the asci were 250-500 x 10 μm and the spores were 2.0 μm broad, breaking up into segments 10-25 μm long. In view of the narrow immature asci these measurements seem plausible. The type specimen contains only one intact apothecium. The species cannot be completely characterized from its scanty type, but seems to be distinct and should be recognizable if recollected. *Sch. alboatrum* and *Sch. cordobensis* are smaller, less erumpent, and have narrower margins.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28219, s/leños podridos, La Plata, XII.1905, C. Spegazzini, holotype of *Sch. gigas*).

(19). *SCHIZOXYLON GRAECUM* see *Stictis graeca*

(20). *SCHIZOXYLON HANSFORDII* see *S. lividum*

(21). *SCHIZOXYLON HENNINGSIANUM* Ploettn., Verh. Bot. Vereins Prov. Brandenburg 41: 95 (1899)

Figure 8

Apothecia at first immersed, opening by a pore and at length becoming somewhat erumpent, 0.3-0.6 mm diam., the margin thin, entire, yellowish-pruinose, KOH+ yellow, the disc black, not pruinose, not deeply urceolate. Margin in cross section c. 40 μm thick, of interwoven brown hyphae 1.5-2.5 μm diam., somewhat crystalliferous on the outer face. The brown hyphae continue beneath the subhymenium but do not form a complete layer. Subhymenium colorless, J-, the cells 2-3 μm diam., forming a layer 20 μm thick. Asci 120-140 x 6-7 (-9-11) μm (80-100 x 9-11 μm according to Hennings and Ploettner, l.c., but I can find no asci shorter than 100 μm which are not obviously immature), the cap 2.5-3.0 μm thick. Paraphyses numerous, filiform, branched once or twice near the apex, swollen to 2.0 μm , brown, intensely J+ blue apically. Ascospores 8, nearly as long as the asci, soon breaking up into simple part-spores 3-5 x 2-2.5 (-3 fide Hennings & Ploettner) μm .

On herbaceous stems, Germany. The species differs from *Sch. berkeleyanum* only in having somewhat smaller apothecia, a narrower margin, simple part-spores, and shorter asci. The specimen appears to be fully mature but may merely represent a variety of *Sch. berkeleyanum*, as was suggested by Rehm (1912).

SPECIMENS EXAMINED: EUROPE: Germany (S, auf *Chenopodium album*, Rathenau, Ploettner 1.1899, isotype of *Sch. henningsianum*)(B, on *Chenopodium*, Rathenau, Kirschstein, 1900)

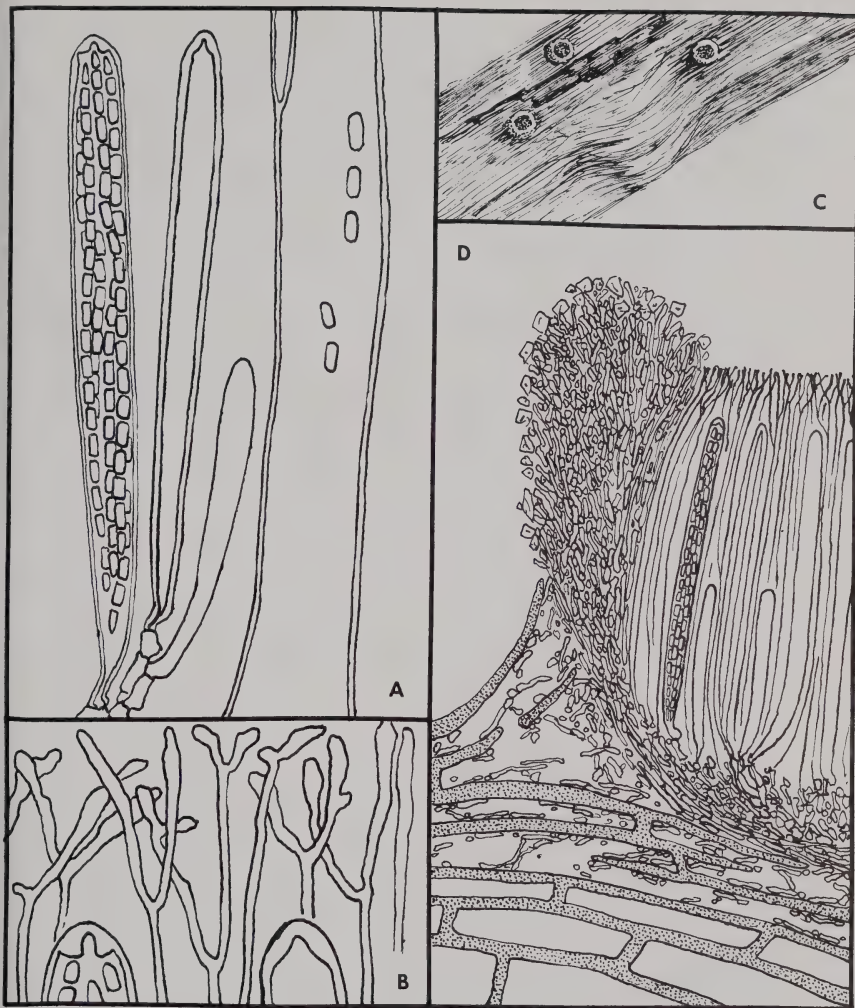


Figure 8. *Schizoxylon henningsianum*. A. Asci, paraphyses, and part-spores, x750. B. Detail of apices of asci, paraphyses, and spores, x1500. C. Habit sketch, x7.5. D. Cross section of margin, x375. Drawn from an isotype in herb. S.

(22). *SCHIZOXYLON HIPPOPHAES* Rehm, Ber. Bayer. Bot. Ges. 13: 160 (1912)
= *Tympanis hippophaes* (Rehm) Sherwood, comb. nov.

Apothecia at first immersed beneath the bark of the host, caespitose, erumpent singly or in small groups, 0.2-0.5 mm diam., sessile on a narrow base, the disc deeply immersed when dry, black, the margin thick, tough, black, white-pruinose, inrolled when dry. Margin paraplechten-

chymatous throughout, of dark hyphae 3-4 μm diam. Paraphyses numerous, filiform, scarcely enlarged above, their apices imbedded in dark gelatinous material and forming an epithecium, J-. Asci long cylindric-clavate, narrowed below, very thick-walled when young, later moderately thick-walled, with the inamyloid, non-refractive apical apparatus characteristic of a *Tympanis*, 190-220 (-250, fide Rehm) $\times$ 12-15 μm , at first containing 8 subglobose primary ascospores, soon budding off chains of cells 5-6 $\times$ 2.0 μm (group A-2 of Oulette and Pirozynski, 1974), in this stage somewhat resembling *Schizoxylon* asci, ultimately budding off innumerable spermatiod bodies 3-4 $\times$ 0.8-1.2 μm .

On bark of *Hippophae*, Germany. Apparently most closely allied to *Tympanis myricariae* Höhn. & Rehm and *T. saligna* Tode, but differing somewhat from both in ascospore measurements and host range. As species limits are now conceived in *Tympanis* (Groves, 1952; Oulette & Pirozynski, 1974) this should probably be considered a distinct species.

SPECIMEN EXAMINED: EUROPE: Germany (S, on *Hippophae*, München, 25.X.1904, Rehm, holotype of *Schizoxylon hippophaes*)

(23). (*SCHIZOXYLON IMMERSUM*) see *Stictis immersa*

(24). (*AGYRIOPSIS JAVANICA*) Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. Abt. 1, 118: 1227 (1909)
= *Bisbyella javanica* Boedijn, Sydowia 5: 211 (1951)

Agyriopsis Sacc. & Sydow (= *Bisbyella* Boedijn) is a synonym of *Schizoxylon* (Sherwood, 1977), but the above species seems to have been assigned to the wrong genus. The leaves in the type packet have nothing corresponding to von Höhnelt's description on them. His slide shows a crush mount of an apothecium which evidently had a reduced, colorless margin, true paraphyses, somewhat thick-walled, clavate asci with no obvious apical apparatus, and clavate 3-septate spores which do not appear to regularly disarticulate. This is definitely not an *Agyriopsis* or *Schizoxylon* and may merely represent fragmentary material of a foliicolous *Bacidia*.

SPECIMEN EXAMINED: ASIA: Java (FH-Höhnelt 4994, Unters. Bl. *Paratropia* sp., Tjibodas, 1907-1908, holotype of *Agyriopsis javanica*)

(25). *SCHIZOXYLON LICHENOIDE* see *S. ligustri*

(26). *SCHIZOXYLON LIGUSTRI* (Schw.) Sherw. (OF 1: 129)
= *S. bagnisianum* Speg., An. Soc. Ci. Argent. 10: 14 (1880)
= *S. lichenoides* Speg., Ibid. 12: 226 (1881)
= *S. bagnisianum* Speg. var. *minus* Speg. in Sacc., Syll. Fung. 8: 698 (1889)

This species appears to be widespread in South America. Spegazzini cites the spore measurements of *S. bagnisianum* as 4.5 μm broad. I could find no spores in the fragmentary type specimen broader than 3.5 μm . LPS 38649, identified by Spegazzini as *S. bagnisianum* but considered a variety there-

of by Saccardo, is typical *Schizoxylon ligustri*.

SPECIMENS EXAMINED: EUROPE: Italy (LPS 38651, Conegliano XI.1878, C. Spegazzini). SOUTH AMERICA: Peru (NY-Pe 414, 431, 437, 439, all Dto. Huanuco, elev. 8500 ft., Dumont, Carpenter, Sherwood, Buriticá, 2.VI. 1976). Argentina (LPS 28217, s/ *Acacia bonariensis*, Buenos Aires, San José de Flores, V.1880, Spegazzini, holotype of *Sch. bagnisianum*; LPS 38649, s/ *Prunum cerasum*, Buenos Aires, Chacarita, V.1880, holotype of *Sch. bagnisianum* var. *minus*; LPS 28216, s/ *Citrus aurantium*, Buenos Aires, Palermo, 15.V.1881, C. Spegazzini, holotype of *Sch. lichenoides*)

- (27). *SCHIZOXYLON LIVIDUM* McAlp., Fung. Dis. Stone Fruit Trees 120 (1901)
 = *Sch. gaubae* Petr., Sydowia 8: 208 (1954)
 = *Sch. hansfordii* Dennis, Kew Bull. 1958: 338 (1958)

Figure 9

Apothecia at first completely immersed beneath the epidermis of the host, visible as black stromatic patches 0.3-0.6 mm diam., raising the substrate into pustules but not becoming erumpent, the margin thick, entire, black, shining, covered for the most part by transparent host epidermis, the disc small, rather more deeply sunken than in most species of *Schizoxylon*, dark grey-pruinose. Accessory thalline margin prominent, consisting of multiple layers of disintegrating host tissue overlain with 30-40 μ m of interwoven dark brown hyphae 2.5-4 μ m diam. forming the visible portion of the margin. Margin in cross section 25-50 μ m thick below, expanded to 150 μ m above, of branched hyphae 1.0 μ m in diam. widely spaced in a gel below, ending above in thickened moniliform brown apices 2-5 μ m diam., resembling the apices of the paraphyses. Subhymenium J-, 20 μ m thick, of small angular colorless cells resting directly on host tissue. Asci 220 x 6-7 μ m, the cap 3.5 μ m thick, pierced by a narrow pore. Paraphyses filiform, 1.0 μ m broad below, 1-3 times branched apically and enlarged to 3-4 (-5) μ m at the apex, which is brown, septate, and somewhat moniliform, exceeding the asci by 25 μ m and forming an intensely J+ blue crystaliferous epithecium. Ascospores 8, nearly as long as the asci, soon breaking up into cubical to short-cylindrical part-spores 2.5-6 x 1.5-2.5 μ m.

On wood and herbaceous stems, Australia. Strong iodine reactions and longer asci distinguish this species from *S. sepinecola* and *S. ligustri*.

SPECIMENS EXAMINED: AUSTRALASIA: Australia (K, on *Linum marginalis*, Meningie, S. Australia, I.1957, W.A.R.I. 7719, holotype of *Sch. hansfordii*)(BPI, Petrak Pilzherbarium 813, on *Davisia latifolia*, N.S.W., II.1954, G. Gauba)(BURNLEY, on dead peach twigs [*Pyrus*], Melbourne, 1901, holotype of *Sch. lividum*)

- (28). (*SCHIZOXYLON MELANOSTICTUM*) Speg., An. Mus. Nac. Hist. Nat. Buenos Aires 19: 456 (1913)

The only fungus resembling the original description in the type packet is a small group of immersed discoid pycnidia with brown margins and deeply immersed ochraceous discs containing innumerable colorless unicellular spores 2 x 1 μ m. Perhaps the specimen once contained ascigerous



Figure 9. *Schizoxylon lividum*. A. Detail of apices of asci, paraphyses, and part-spores, xl500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype of *Sch. hansfordii*.

material, but no trace of it remains, and the species cannot be characterized from Spegazzini's description alone. According to Spegazzini (l.c.) the species had asci 200 x 8-10 μm containing globose part-spores 1.5-1.75 μm diam., a dark margin, and honey-colored disc. The description corresponds roughly to the characters of *Acarosporina hormospora*, q.v.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28220, s/*Lippia geminata*, La Plata, Ensenada, 8.X.1905, C. Spegazzini, holotype of *S. melanostictum*)

(29). *SCHIZOXYLON PACHYCHLAMYDUM* Sherwood, spec. nov.

Figure 10

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.8-1.2 mm diam., margine integro, nigro, disco griseo. Margo in sectione transversali 500 μm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis et achromis constans. Paraphyses filiformes, ramosae, 425-450 x 1.0 μm , apice non incrassatae, brunneae, in

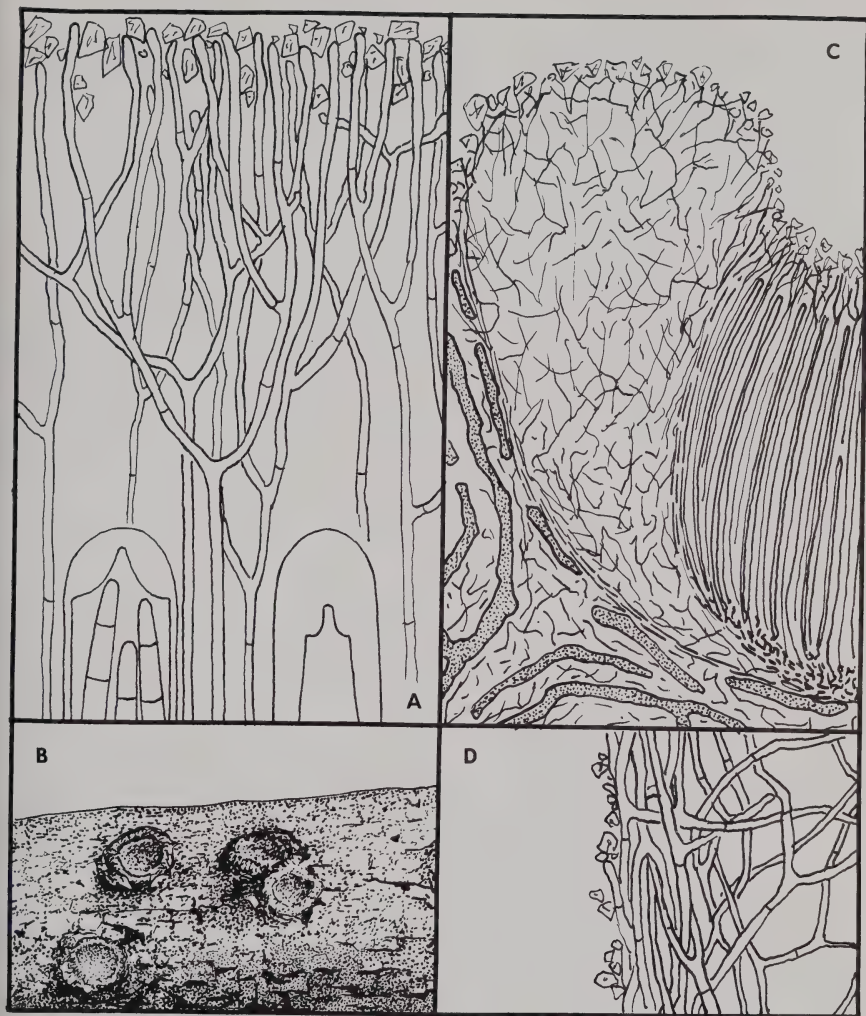


FIGURE 10. *Schizoxylon pachychlamydatum*. A. Detail of apices of asci, paraphyses, and spores, xl500. B. Habit sketch, x7.5. C. Cross section of margin, x75. D. Detail of outer face of margin, x750. Drawn from NY-Pe 432.

iodo caerulescentes. Asci 350-400 x 8-10 μ m, apice 6 μ m crassi, 8-spори. Sporae 325-400 x 2-2.5 μ m, cellulis 4-7 μ m longis.

HOLOTYPE: NY-Pe 432, vicinity km post 450 from Lima, on the Huanuco-Tingo Maria Rd., Dpto. Huanuco. Elev. 8500 ft. K. P. Dumont, S. E. Carpenter, M. A. Sherwood, P. Buriticá, 2 July 1976.

Apothecia at first immersed, becoming erumpent, 0.8-1.2 mm diam., the margin raised, thick, black, dark grey-pruinose, not splitting away from the hymenium when dry, the disc concave, pale grey-pruinose. Margin

in cross section 500 μm thick, swelling markedly when re-hydrated, lacking periphysoids and internal crystalline inclusions, moderately crystalliferous on the upper and outer faces. Outermost layer of the margin c. 10 μm thick, of agglutinated dark brown hyphae 1.5-2 μm thick enclosing a matrix of colorless hyphae 1.0 μm diam. widely spaced in a gel. The boundary between the margin and the hymenium is marked by a few layers of tightly-packed colorless hyphae, without any included host tissue. Asci 350-400 x 8-10 μm , very thick-walled when young, the cap 6 μm thick, with a broad pore. Ascospores 8, nearly as long as the asci, 2-2.5 μm broad, the cells 4-7 μm long, not disarticulating. Paraphyses numerous, filiform, much-branched apically but scarcely enlarged, brown at their tips and faintly J+ blue, abundantly crystalliferous, forming an epithecium c. 50 μm thick. Subhymenium colorless.

On twigs, Peru. The very thick gelatinous margin and darker pigmentation distinguish this species from *Sch. cor-dobensis*.

SPECIMEN EXAMINED: See holotype, above.

(30). *SCHIZOXYLON PALLESCENS* Sherwood, spec. nov.

Figure 11

Ascomycetum primum immersum, non erumpens, non profunde cupulatum, 0.5-1.0 mm diam., margine integro, albo, disco pallide ochraceo vel griseo. Margo in sectione transversali 150 μm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, apice ad 2.0 μm incrassatae, achromae, in iodo non caerulescentes. Asci 350-425 x 9-10 μm , apice 7.5 μm crassi, 8-spori. Sporae 325-400 x (2.5-) 3.0 μm , cellulis 3-5 μm longis.

HOLOTYPE: NY-Ve 3283, on unidentified wood, 49 km N. of San Cristobal, on the San Cristobal-La Grita rd., Edo Tachira. K. P. Dumont, G. J. Samuels, L. Borjas, 28 July 1971. ISOTYPE: VEN.

Apothecia at first immersed, opening by a pore or by splitting the substrate irregularly, 0.5-1.0 mm diam., the margin thick, entire to 2-4 lobed, not lacerate, white-pruinose, the disc translucent-ochraceous or somewhat greyish, shallowly cupulate, not splitting away from the margin when dry. Thalline margin prominent, continuing beneath the hymenium. Margin in cross section 150 μm thick, of colorless interwoven hyphae 1.0 μm diam., not notably gelatinous, with scattered crystals near the summit and in the part nearest the hymenium; periphysoids absent. Subhymenium 65 μm thick, of small, colorless, angular cells, J- or faintly J+ blue in older apothecia. Asci 350-425 x 9-10 μm , thick-walled when young, with a distinct apical cap 7.5 μm thick pierced by a fairly broad pore. Paraphyses numerous, filiform, entirely colorless, J- or faintly J+ blue in older apothecia, exceeding the asci by 30 μm , their apices inflated to 2.0 μm , branching 1-3 times to form a distinct epithecium. Ascospores 8, nearly as long as the asci, (2.5-) 3.0 μm broad, slightly thick-walled or obscurely sheathed, not markedly constricted at the septa or disarticulating, the cells 3-5 μm long.



Figure 11. *Schizoxylon pallescens*. A. Details of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from NY-Ve 3283.

On wood, Venezuela. The species is very similar to *Sch. cordobensis*, from which it differs principally in having spores twice as broad.

SPECIMEN EXAMINED: See holotype, above.

(31). *SCHIZOXYLON PRATENSE* Sherwood, spec. nov.

Figure 12

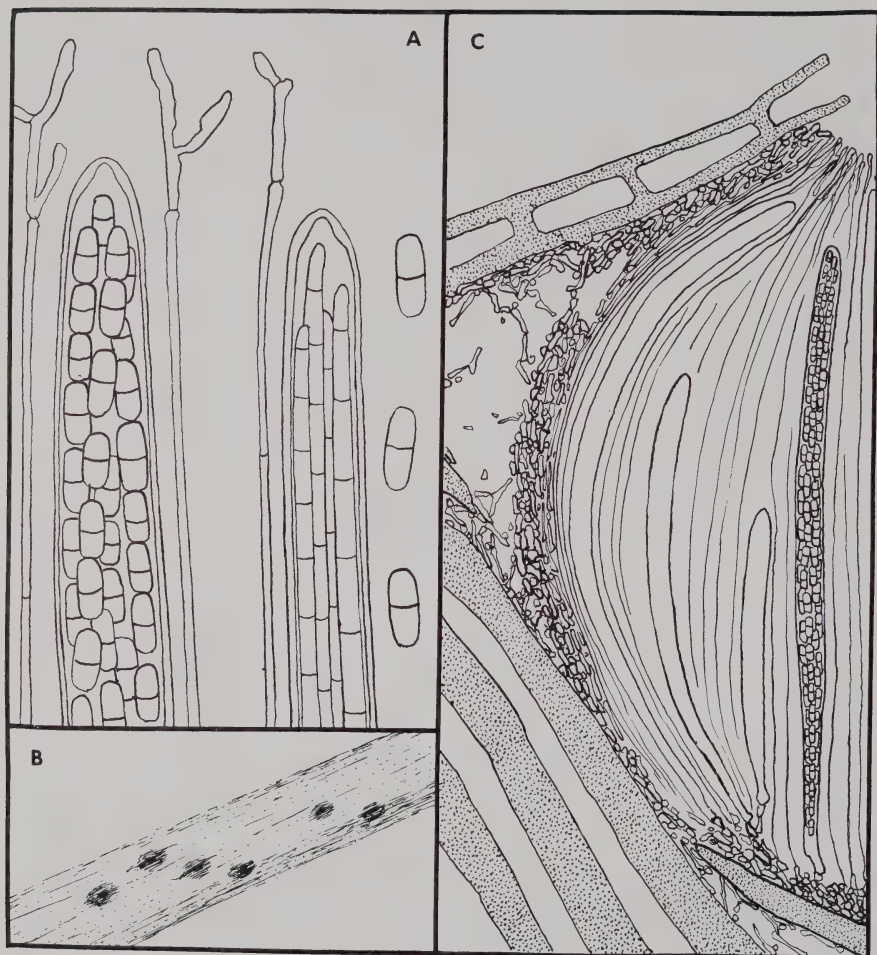


Figure 12. *Schizomyces pratense*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.3-0.6 mm diam., margine integro, nigro, disco nigro. Margo in sectione transversali c. 10 μ m crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis constans. Paraphyses filiformes, apice ad 2.0 μ m incrassatae, ramosae, brunneae, in iodo non caerulescentes. Asci 250 x 7(-9) μ m, apice non incrassatae, 8-spori. Sporae 200-225 x 2.5-3 μ m, cellulis 3-4 μ m longis, ad septa se disjungentibus et articulos 1-septatis formantibus.

HOLOTYPE: BPI, on *Muhlenbergia* sp. ex Mexico, intercepted at New York City [Plant Quarantine] by Plummer & McConnel, Aug. 30 1940.

Apothecia small, 0.3-0.6 mm broad, remaining completely immersed except for the black punctiform disc, not pruinose, visible on the surface of the substrate as oblong, black perithecioid bodies showing through the colorless epidermis of the host. Subhymenium colorless. Margin very reduced, consisting of 2-3 layers of dark brown interwoven hyphae 2.0-3.0 μm diam. cemented in brown amorphous material. Periphysoids and crystals absent. Iodine reactions none. Asci 250 x 7(-9) μm , fairly thin-walled when young, without a defined apical cap. Paraphyses numerous, filiform, often apically branched, pale brown, inflated to 2.0 μm at the apex, forming an epithecium c. 10 μm thick. Ascospores 8, nearly as long as the asci, 2.5-3.0 μm broad, soon disarticulating to form 1-septate part-spores 6-8 μm long.

On grass used as packing material, Mexico. The morphology and habitat of this species are so distinctive that I have ventured to describe it despite the lack of accurate collection data.

SPECIMEN EXAMINED: See holotype, above.

(32). SCHIZOXYLON PSEUDOCYANOSPORUM Sherwood, spec. nov.

Figure 13

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 1.0 mm diam., margine integro, disco griseo. Margo in sectione transversali c. 30 μm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis constans. Paraphyses filiformes, ramosae, apice ad 2.0 μm incrassatae, brunneae, in iodo caerulescentes. Asci 80-120 x 12-13 (-15) μm , apice 5 μm incrassatae, 8-spori. Sporae 60-75 x 5 μm , cellulis 2-5 μm longis.

HOLOTYPE: BPI, on *Pinus excelsa*, Kagan Valley, Shagran, West Pakistan, July 16, 1951. S. Ahmad.

Apothecia at first immersed in elongated greenish-grey stromatic pustules, not becoming erumpent, c. 1.0 x 0.5 mm, strongly compressed with the grain of the wood, opening by splitting the overlying substrate longitudinally to expose the flat, greenish-grey pruinose disc. The narrow margin is obscured by the overlying stromatized wood. Margin in cross section c. 30 μm thick, of pale brown non-carbonized hyphae 1.5 μm diam., not notably gelatinous, with a few scattered crystalline inclusions. Subhymenium colorless, 20 μm thick, J-. Asci 80-120 x 12-13(-15) μm , very thick-walled when young, the cap 5 μm thick, pierced by a broad pore. Paraphyses numerous, filiform, branched and brown near the apex, inflated to 2.0 μm , J+, forming an epithecium 30 μm thick. Ascospores 8, 60-75 x 5 μm , tapering below, septate, the cells 2-5 μm long, not regularly disarticulating at the septa.

On decorticated conifer wood, Pakistan. The fungus is generally accompanied by small erumpent black fructifications consisting of masses of globose dark green bodies 1.5 mm diam. intermingled with hyphae and gel, perhaps an imperfect stage. The oblong stromatic pustules on bleached and decorticated wood superficially resemble those of *Robergea* (formerly *Cyanospora*) *albicedrae* (Heald & Wolf) Sacc. & (above) μm diam.



Figure 13. *Schizoxylon pseudocyanosporum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x750. Drawn from the holotype.

Trav.; hence the specific spithet.

Müller and Ahmad (1962) recorded this species from Pakistan under the name *Lecanidion bacilliferum* (Karst.) Müller & Ahmad ($\equiv$ *Patellaria bacillifera* Karst.), a species synonymized with *Lecanactis insignior* (Nyl.) Vain. by Zahlbruckner (1922). Karsten's type is filed under *L. insignior* in Vainio's herbarium. This specimen (TUR-Vainio 26504a, Brasilia, Minas Geraes 1885, Lafayette 300) bears no resemblance to the Pakistani fungus and appears to be a good

Lecanactis with orbicular, superficial fruitbodies. Müller (personal communication) claimed that the asci of *Sch. pseudocyanosporum* were bitunicate, but I have been unable to confirm this. The species is more like *Schizoxylon sepincola* than any species of *Lecanidion* known to me.

SPECIMEN EXAMINED: see holotype, above.

- (33). (*SCHIZOXYLON SAROTHAMNI*) (Fckl.) Rehm, Rabenh. Kryptogamenfl. ed. II, 1(3): 183 (1888)
 = *Calloria? sarothamni* Fckl., Jahrb. Nassauischen Vereins Naturk. 27-28: 57 (1873)

Fuckel (l.c.) described a fungus whose imperfect stage was represented by Fungi Rhenani I: 2568. The material I examined, evidently the same "conidial" stage, is an immature or poorly-preserved Tremellaceous fungus with cruciately divided basidia. The ascigerous stage was said to have cylindrical polysporous asci but cannot be characterized from the original description. Obviously it has no connection with its alleged conidial stage.

SPECIMEN EXAMINED: EUROPE: Germany (BPI, Herbar Barbier-Boissier 1459, on *Sarothamnus*, Nassau, ex herb. Fuckel)

- (34). *SCHIZOXYLON SCHWEINITZII* Sherwood, spec. nov.

Figure 14

Ascocarpi primum immersi, non erumpescentes vel erumpescentes, 0.4-0.8 mm diam., margine integro, albo, disco pallide ochraceo. Margo in sectione transversali 25 μ m crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, apice non incrassatae, ramosae, achromae, in iodo non caerulescentes. Asci 300-400 x 8 (-10) μ m, apice 3 μ m crassi, 4- vel 8-spori. Sporae 250-375 x 2.5-3.5 μ m, cellulisi 3-6 μ m longis, ad septa se disjungentibus et artculos simplices formantibus.

HOLOTYPE: BPI, on *Citrus*, Highlands Hammock, Florida, USA, Shear 260, Feb. 17, 1937.

Apothecia at first immersed, dissolving a small pore in the substrate and eventually becoming partially erumpent, 0.4-0.8 mm broad, the margin at first closed over the hymenium, white-pruinose, tending when mature to open by a transverse slit to expose the pale ochraceous disc, sometimes opening irregularly, without a stellate border. Margin in cross section 25 μ m thick below, 50-60 μ m thick above (the lips arch over the hymenium, forming a sort of peridium), of colorless hyphae 1.5 μ m diam., slightly gelatinous, covered with small colorless crystals on the outer face. Accessory thalline margin moderately prominent. Subhymenium 10 μ m thick, J-, resting on a layer of crystals and disintegrating host tissue. Asci 300-400 x 8(-10) μ m, the cap 3 μ m thick, pierced by a broad pore. Ascospores 4 or 8, nearly as long as the asci, 2.5-3.5 μ m broad, soon breaking apart at the septa to form part-spores 3-6 μ m long. Paraphyses colorless throughout, 1.0 μ m broad, branched apically but scarcely enlarged, J-, crystalliferous, forming an epithecium 15 μ m thick.

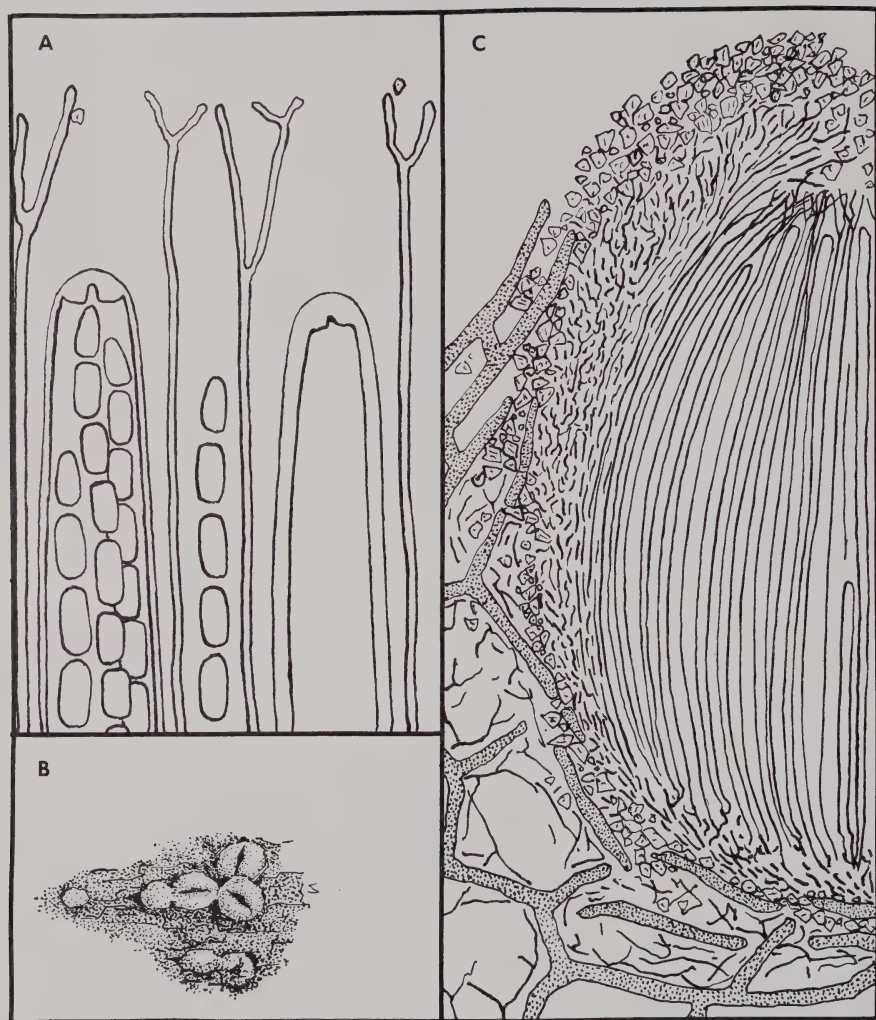


Figure 14. *Schizoxylon schweinitzii*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x750. Drawn from the holotype.

On wood, Florida. The species is distinguished from *S. pruiniferum* Sherw. and *S. floridanum* by the broader part-spores and longitudinal dehiscence of the ascocarp.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, Sterlington LA, Shear, March 25, 1941; on *Citrus?*, Florida, Shear 17.II.1937; on *Sambucus*, Florida, Shear 20.III.1943; on *Callicarpa*, Florida, Shear 12.XI.1941; on *Smilax*, Florida, 20.II.1942; on *Sambucus*, Florida, Shear 289, 1.II.1937)

(35). *SCHIZOXYLON SEPINCOLA* Pers. (OF 1: 138)

In addition to the localities previously recorded, this species also occurs in Crimea and the Canary Islands. The Canary island specimens were collected on small dead twigs of a non-gymnosperm host and are less erumpent than specimens on bare wood, but appear identical to typical *Sch. sepincola* microscopically.

SPECIMENS EXAMINED: ASIA: USSR (H, herb. Nylander 4732, on *Juniperus*, Son-Dagh, Tauria). AFRICA: Canary Islands (CUP-MM 747, La Palma, on *Cistus*, Korf, Denison, Kohn & Sherwood, 15.I.1976; MM-1062, Gran Canaria, on *Cistus*, *Ibid.*, 21.I.1976; MM-1064, *Ibid.*)

(36). (*AGYRIOPSIS STRYCHNI*) Rehm, Hedwigia 39: 216 (1900)

I could find nothing resembling Rehm's original description in the type packet. Von Höhnelt (1909) suggested that the species might be a foliicolous lichen, which Rehm's description of apothecia occurring on epiphyllous white spots containing green gonidia would certainly support. In any case it is highly unlikely that the species is an *Agyriopsis* (= *Schizoxylon*).

SPECIMEN EXAMINED: SOUTH AMERICA: Brazil (S, Sta. Catharina, Ule 1454, on *Strychnus*, holotype of *Agyriopsis strychni*).

(37). *SCHIZOXYLON TAENIOIDES* Speg., An. Mus. Nac. Hist. Nat. Buenos Aires 23: 102 (1912)

Figure 15

Apothecia gregarious, at first immersed, becoming erumpent, 0.3-0.5 mm diam., the margin black, entire or somewhat rugose, narrow, not clearly delimited from the shallowly cupulate matte black disc. Margin in cross section essentially obsolete, consisting of 2-3 layers of interwoven pale brown hyphae 2.0-3.0 μ m diam. Thalline margin moderately prominent, c. 30 μ m thick, containing disintegrating host tissue, narrow-diameter colorless hyphae, and dark torulose hyphae evidently belonging to another fungus. Asci 150-200 x 8-9 (-12) μ m, the cap 5 μ m thick but very inconspicuous, pierced by a broad pore. Paraphyses filiform, 1.0 μ m broad below, much-branched and enlarged to 3-5 μ m at the apex, dark brown, J+, forming an epithecium 15 μ m thick. Ascospores 8, nearly as long as the asci, 3.0 μ m broad above, tapering somewhat below, soon breaking up into globose part-spores 2.0 (below)-3.5 (above) μ m diam.

On wood, Argentina. The ascospores are somewhat less tapered than Spegazzini implied in his original description. Parst spores enlarge from the ascus apex downward after they disarticulate (see figure 14). *Sch. taenioides* is similar to *Sch. lividum*, but differs in having globose part-spores, a less well-defined ascus cap, and narrower margin.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28215, s/*Condalia lineata*, Mendoza, Potrerillas, 26.IV.1910, C. Spegazzini, holotype of *Sch. taenioides*).

(38). *SCHIZOXYLON TENUISPORUM* see *S. cordobensis*

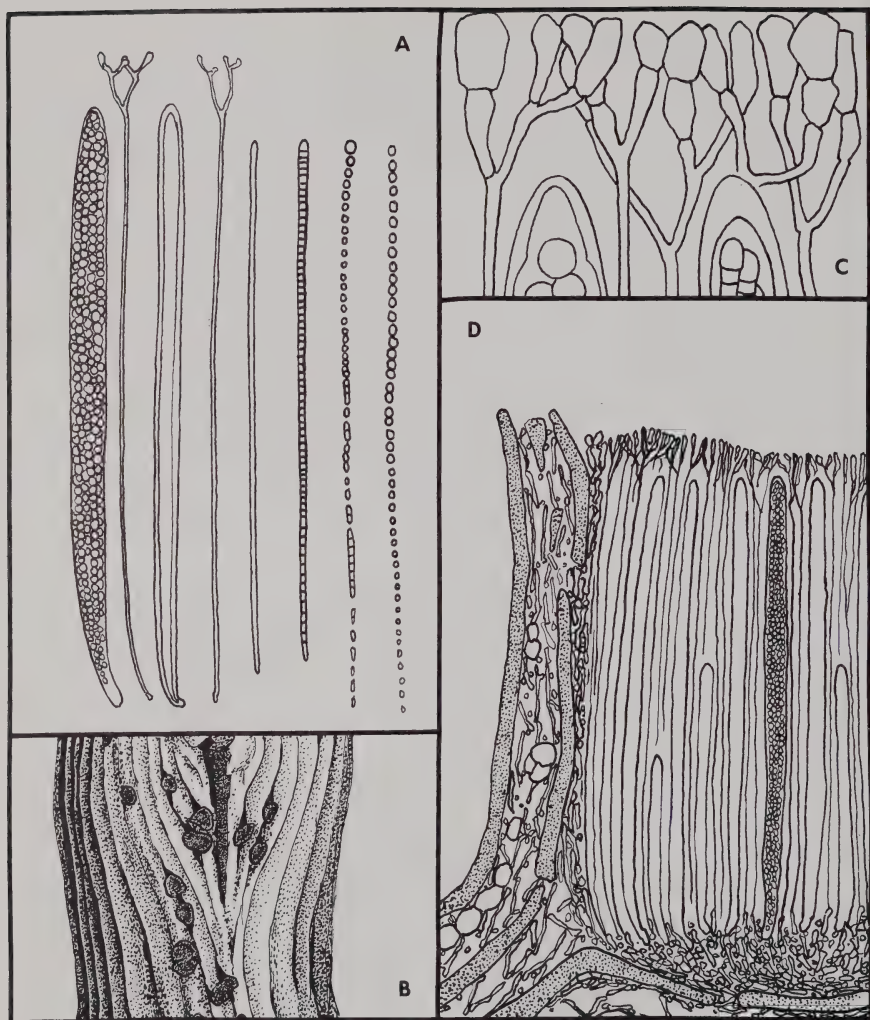


Figure 15. *Schizoxylon taenioides*. A. Asci, paraphyses, spores, and part-spores, showing ascospore development, x375. B. Habit sketch, x7.5. C. Detail of apices of asci, paraphyses, and spores, x1500. D. Cross section of margin, x300. Drawn from LPS 28215.

(39). *SCHIZOXYLON YUCCAE* Maubl., Bull. Soc. Mycol. France 20: 72 (1904)

I was unable to locate any material, type or otherwise, of this species. According to the original description the apothecia were amphigenous, minute, with a white margin and plane dark colored disc, with asci $80-100 \times 6-8 \mu\text{m}$ and part-spores $1.5-3 \times 1.5 \mu\text{m}$. The species occurred on *Yucca* in France.

(5). *STICTIS* Pers., Obs. Mycol. 2: 73 (1799)

Nomenclature, generic characters, and the majority of the species were treated in a separate paper (Sherwood, 1977). The following species are either transfers from *Schizoxylon* or were discovered amongst unidentified and misidentified *Schizoxylon* species in various herbaria.

(1). *STICTIS* CONOTREMOIDES Sherwood, spec. nov.

Figure 16

Ascomycarpium primum immersum, erumpescentes, 0.8-1.2 mm diam., margo integro, griseo, disco griseo. Margo in sectione transversali 120-150 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 3-4 µm diam., brunneo. Stratum crystallinum abest. Periphysioidea 75 x 2.5-3 µm, ramosa, brunnea. Paraphyses filiformes, ramosae, apice ad 1.5-2 µm incrassatae, brunneae, in iodo non caerulescentes. Asci 220-250 x 9-11 µm, apice 5-6 µm crassi, 8-spori. Sporae 200-225 x 4-4.5 µm, cellulis 3-5 µm longis.

HOLOTYPE: BPI, Fungi Boreali-Americani 369c, Alaska, 151-152° W, 69° 30' N, on *Salix alixensis*, dried stream bed 3 mi. W. of Tuluga L. alt. 1000 M. G. A. Llano, 7/12/1949.

Apothecia at first immersed, becoming erumpent, 0.8-1.2 mm diam., the margin thick, entire, dark grey, involute, the disc deeply immersed, dark grey, splitting away from the margin when dry. Margin in cross section 120-150 µm thick, with a few crystalline inclusions but lacking a distinct crystalline layer, the wall 75 µm thick, of tightly-packed interwoven dark brown hyphae 3-4 µm thick. The brown layer beneath the subhymenium is continuous with the marginal paraphyses rather than with the wall. Periphysoids 75 x 2.5-3 µm, faintly brown, especially near the summit of the margin, much-branched and appearing pseudoparenchymatous. Subhymenium 20 µm thick, faintly J+ blue. Asci 220-250 x 9-11 µm, thick-walled when young, with a distinct apical cap 5-6 µm thick, 8-spored. Spores nearly as long as the asci, 4-4.5 µm broad, the cells 3-5 µm long, not obviously sheathed or coiling. Paraphyses 1.0 µm broad below, enlarged to 1.5-2 µm above, brown, frequently branched, J-, not crystalliferous, forming an epithecium. Marginal paraphyses in an agglutinated layer 3-4 deep, brown along their entire length.

On decorticated wood in the Alaskan arctic. In addition to being morphologically distinct from *S. lumbricus* Sherw. and *S. serpentaria* Ell. & Ev., this specimen was collected far outside the known range of other species of *Stictis*. *S. conotremoides* looks superficially a good deal like *Conotrema urceolatum* (Ach.) Tuck, but is not lichenized.

SPECIMEN EXAMINED: See holotype, above.

(2). *STICTIS* CUNDINAMARCAE Sherwood, spec. nov.

Figure 17

Ascomycarpium primum immersum, profunde cupulati, 0.4-1.0 mm diam., margo integro, albo, disco pallide ochraceo. Margo in sectione transversali 80-90 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 1.5-

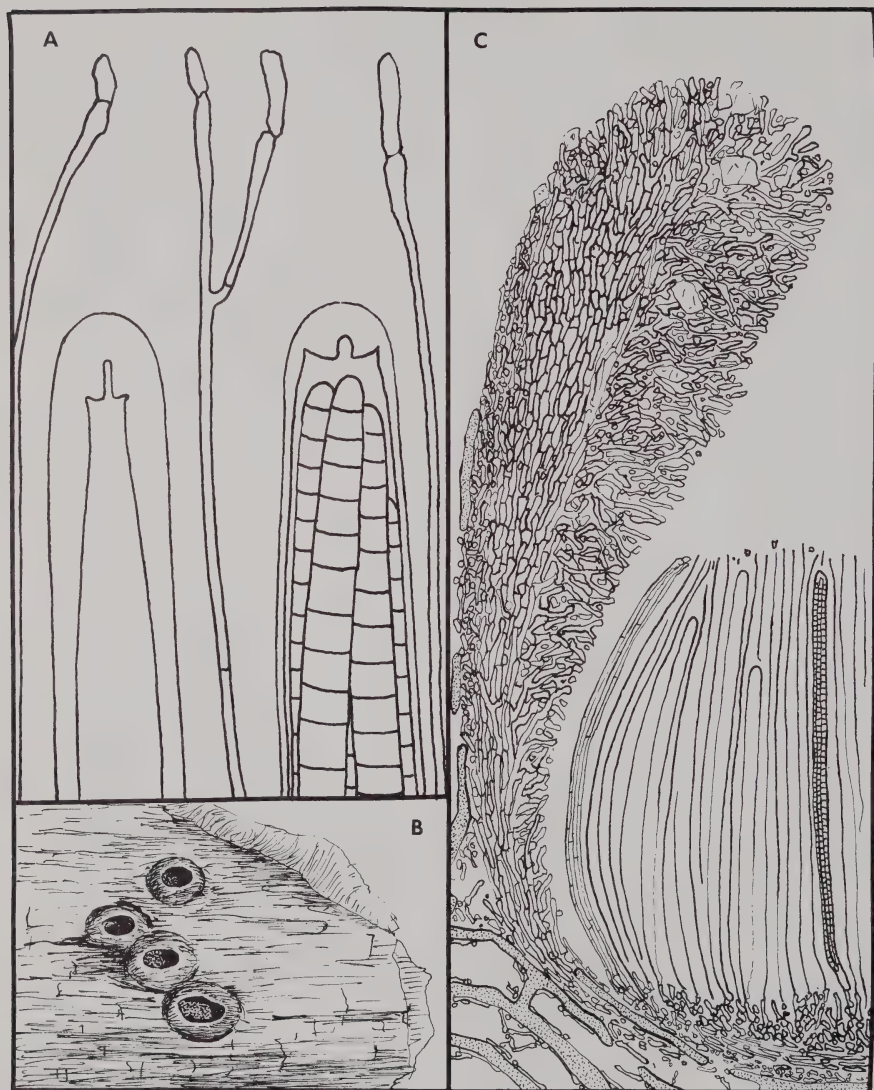


Figure 16. *Stictis conotremoides*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from the holotype.

2.0 μm diam., achromo. Stratum crystallinum 40-50 μm crassum. Periphysioidea 60 x 1.5 μm , non ramosa. Paraphyses filiformes, ramosae, circinatae, apice ad 1.5 μm incrassatae, achromae, in iodo non caerulescentes. Asci 300-320 x 6-7 (-10) μm , apice 7-8 μm crassi, 4-8 spori. Sporae 250 x 3.5-4.5 μm , vagina gelatinosa involutae, ad septa se disjunctibus et articulos 2.5-4.5 μm longis formantibus.

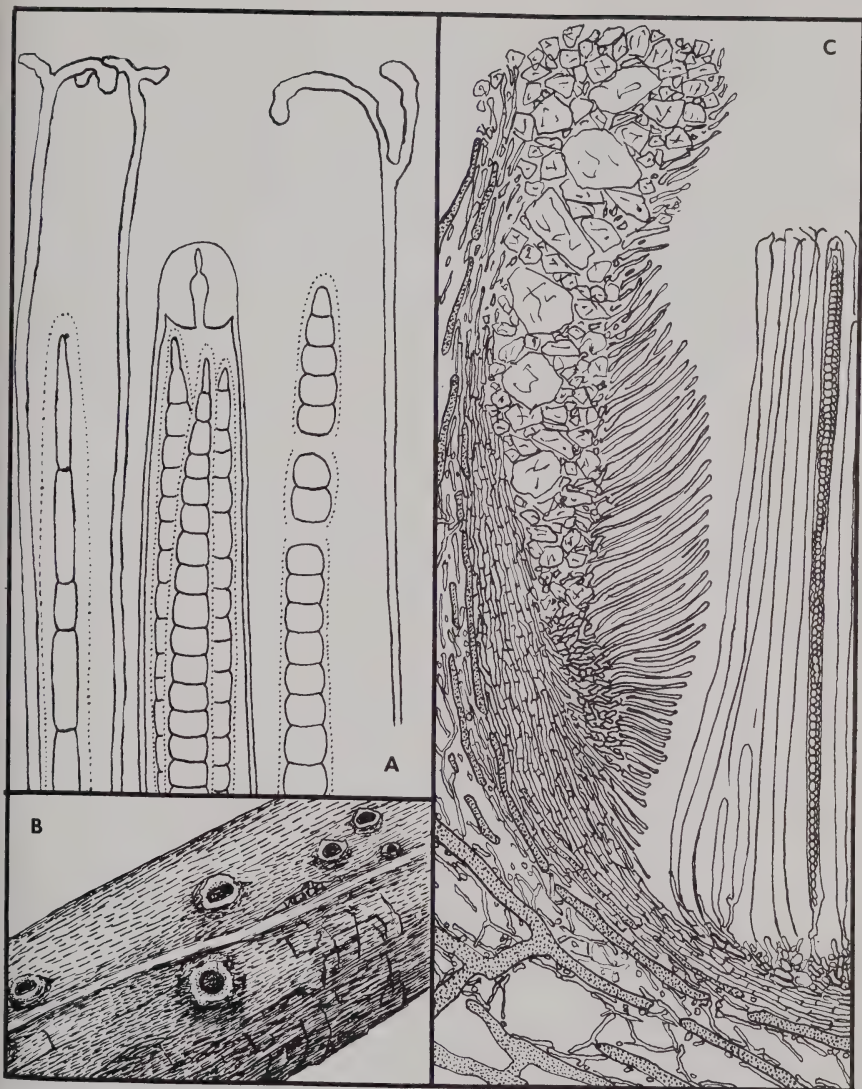


Figure 17. *Stictis cundinamarcae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype.

HOLOTYPE: COL-Dumont 2217, on indet. twig, vicinity of km post 18 from Bogota on the Bogota-Villavicencia road via Caqueza, Dpto. Cundinamarca. Elev. ca. 10,200'. K. P. Dumont, P. Buriticá, J. Luteyn, 7 January 1976. ISOTYPUS: NY.

Apothecia at first immersed, raising the substrate into prominent pustules but not becoming erumpent, 0.4-1.0 mm

diam., the margin thick, white-pruinose, entire to lacerate, the disc deeply immersed, pale ochraceous, not splitting away from the margin when dry. Margin in cross section 80-90 μm thick, with a moderately prominent accessory thalline margin. Crystalline layer distinct, narrow. Wall colorless, 20 μm thick, of closely-packed non-gelatinous hyphae 1.5-2.0 μm diam., continuing beneath the subhymenium. Subhymenium 20 μm thick, J-. Periphysoids numerous, 60 x 1.5 μm , mostly unbranched, forming a compact layer. Asci 300-320 x 6-7 (-10) μm , the cap 7-8 μm thick, pierced by a complex narrow pore. Ascospores 8, sometimes fewer (some aborting), c. 250 μm long, 3.5-4.5 μm broad, obviously sheathed, particularly when young, constricted at the septa, moniliform, tending to disarticulate at the septa, the cells 2.5-4.5 μm long. Paraphyses numerous, branched and circinate, inflated to 1.5 μm at the apex, J-.

On dead twigs at relatively high elevations, South America.

SPECIMENS EXAMINED (see also holotype, above): South America: Colombia (NY-Co 7036, Norte de Santander, Dumont, Sherwood, Velasquez, 21.VIII.1976). Venezuela (NY-Ve 3342, Edo. Tachira, Dumont, Samuels, Borjas, 29.VII.1971).

(3). *STICTIS DAVIDSONII* Sherwood, spec. nov.

Figure 18

Ascomycota primum immersa, erumpentes, profunde cupulati, 0.5-1.5 mm diam., margo integro, griseo vel nigro, disco pallide brunneo. Margo in sectione transversali 100-120 μm crassus, siccus ab hymenio se abrumpens, hypharum pariete 2.0-3.0 μm diam., brunneo. Stratum crystallinum abest. Periphysoides 40-50 x 0.75 μm , ramosae, achromae, et 30 x 2.0 μm , non ramosae, brunneae. Paraphyses filiformes, simplices, apice non incrassatae, brunneae, in iodo non caerulescentes. Asci 220-250 x 7 μm , apice 6 μm crassi, 8-spori. Sporae 200-225 x 2.5 μm , cellulis 2-3 μm longis, ad septa se disjungentibus et articulos 3-septatis formantibus.

HOLOTYPE: BPI, on *Populus temuloides*, 1/3 m. N.W. of Mesa Lakes Resort, Colorado, USA, June 18, 1930, R. W. Davidson 338-e.

Apothecia at first immersed, opening by a pore and eventually becoming erumpent, 0.5-1.5 mm diam., orbicular, the margin thick, dark grey to black, entire, moderately white-pruinose, the disc deeply immersed, dark ochraceous to brown, splitting away from the margin when dry. Margin in cross section 100-120 μm thick, with a prominent accessory thalline margin, the wall 40-60 μm thick, on brown non-carbonized hyphae 2.0 (-3.0 above) μm diam., not notably gelatinous, with scattered crystalline inclusions, continuing beneath the subhymenium as a layer 40-50 μm thick. Lower periphysoids 40-50 x 0.75 μm , branched, colorless, with gelatinous walls. Upper periphysoids 30 x 2 μm , pale brown, mostly unbranched, not gelatinous. Crystalline layer absent. Subhymenium 15 μm thick, J- or faintly J+ blue. Asci cylindrical, 220-250 x 7 μm , the cap 6 μm thick, pierced by a complex conical pore. Ascospores 8, nearly as long as the asci, 2.5-3 μm broad, breaking apart at every 4th septum to form 3-septate part-spores 8-12 μm long.

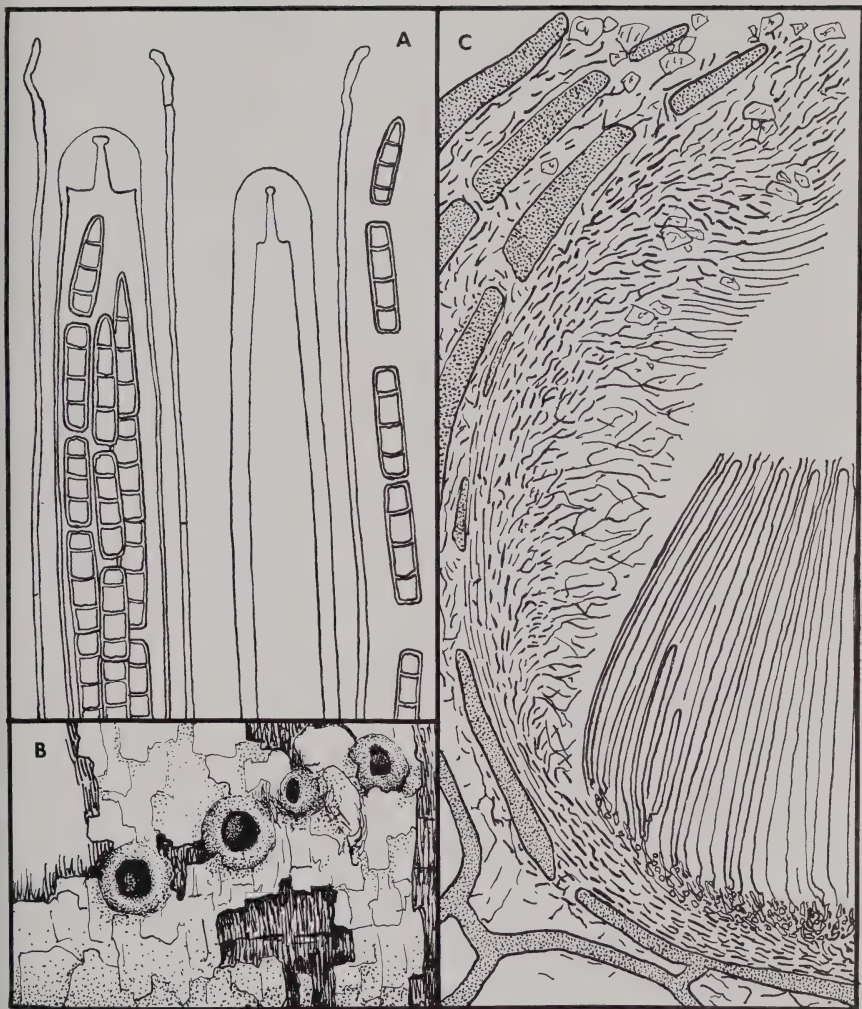


Figure 18. *Stictis davidsonii*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from BPI-Davidson 338-e.

Paraphyses filiform, 1.0 μm broad below, not enlarged or branched above, J-, their apices pale brown. Brown marginal paraphyses inconspicuous, tending to darken with age.

On decorticated wood, Colorado, USA.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, on *Populus*, Colorado, Davidson 335-a, 18VI.1930; on *Salix*, Colorado, Davidson 318-c; on *Salix* or *Populus*, Davidson 315, Colorado, 18.VI.1930)

- (4). STICTIS GRAECAE (Höhnelt) Sherwood, comb. nov.
 = *Schizoxylon graecum* Höhn., Sitzungsber. Kaiserl. Akad.
 Wiss., Math.-Naturwiss. Kl. Abt. 1, 116: 638 (1907)

Figure 19

Apothecia at first immersed, opening by a pore, eventually becoming somewhat erumpent, 0.3-1.0 mm diam., the margin moderately thick, entire or somewhat lacerate, white-pruinose, the disc moderately deeply immersed, dark grey, not pruinose. Margin in cross section c. 100 μ m thick. Crystalline layer indistinct, composed of isolated non-rosetiform crystals. Wall c. 20 μ m thick, of pale brown, tightly packed hyphae 1.5-2.5 μ m diam., not notably gelatinous, not continuing beneath the subhymenium. Periphysoids 50-60 x 1.0 μ m, branched, immersed in a gel. Subhymenium colorless, 20 μ m thick, resting directly on host tissue, J-. Asci 190-250 x 6-7 (-10) μ m, the cap 4 μ m thick, pierced by a broad pore. Paraphyses filiform, 1.0 μ m broad below, branched and enlarged to 1.5 μ m apically, the apex pale brown, J-. Spores 8, nearly as long as the asci, 2-2.5 (-3, fide von Höhnelt) μ m broad, the cells 2-5 μ m long, not sheathed or coiling, not disarticulating at the septa.

On twigs, Greece. The species is similar to *Stictis korfii* Sherw., but the spores are decidedly shorter and broader. Brown paraphyses, a colorless subhymenium, and prominent periphysoids distinguish this species from *S. mollis* Pers.

SPECIMEN EXAMINED: EUROPE: Greece (FH-Höhnelt A4659, ad ramos *Olea europ.* insul. Corfu (Griechland) G. Eggerth, holotype of *Sch. graecum*)

- (5). STICTIS HYPOPHYLLA Sherwood, spec. nov.

Figure 20

Ascocarpi primum immersi, profunde cupulati, 0.3-0.5 mm diam., margine lacerato, albo, disco pallide ochraceo. Margo in sectione transversali c. 60 μ m crassus, siccus ab hymenio se abruptens, hypharum pariete 1.5-3.0 μ m diam., achromo. Stratum crystallinum abest. Periphysoidae 15-20 x 1.0 μ m, non ramosa. Paraphyses filiformes, simplices vel ramosae, 250 x 0.8-1.0 μ m, achromae, in iodo non caerulescentes. Asci 200-250 x 4-4.5 (-5) μ m, apice 2.5 μ m crassi, 8-spori. Sporae 190-225 x 0.8-1.0 μ m, cellululis 10-12 μ m longis.

HOLOTYPE: COL-Dumont 3327, on indet. leaf of fern, Universidad de Nariño property 3.5 mi. from a point 7 km from Pasto on the Pasto-Ipiales road, Dpto. Nariño, Colombia, K. P. Dumont, J. L. Luteyn, L. A. Molina, 24 Jan. 1976. ISOTYPE: NY, CUP.

Apothecia densely gregarious, 0.3-0.5 mm diam., at first immersed, becoming erumpent, the margin thick, white-pruinose, lacerate, the disc deeply immersed, pale ochraceous, not splitting away from the margin when dry. Margin in cross section c. 60 μ m thick, externally pruinose but without a well-defined internal crystalline layer, the wall colorless, 35-50 μ m thick, of interwoven hyphae 1.5-3.0 μ m diam., with thick glassy walls. Periphysoids 15-20 x 1.0 μ m, simple, the upper ones somewhat bulbous, the lower ones pointed, rather widely spaced in a gel. Subhymenium colorless, c. 20 μ m thick, J-, resting on 10 μ m of wall. Asci

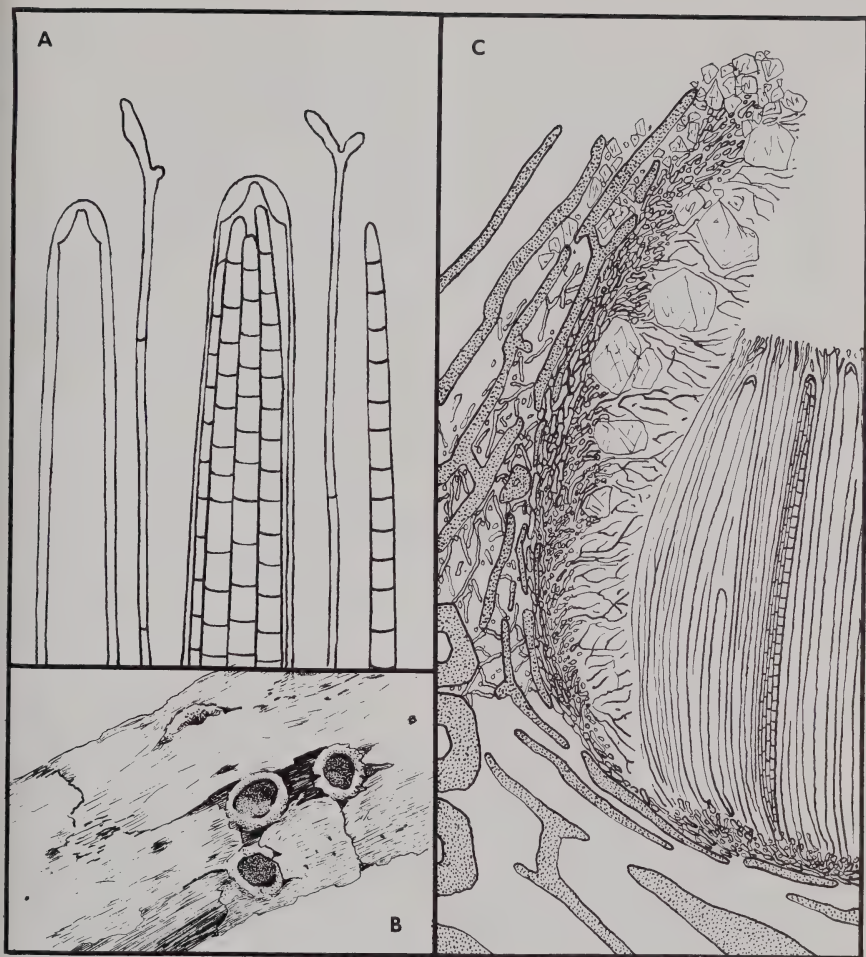


Figure 19. *Stictis graecae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype of *Schizoxylon graecum*.

200-250 x 4.0-5.5(-5) μm , the cap 2.5 μm thick, pierced by a narrow pore. Hymenium J-. Ascospores 8, nearly as long as the asci, 0.8-1.0 μm broad, the cells 10-12 μm long, not sheathed or coiling. Paraphyses 1.0 μm broad below, narrower above, simple to sparingly branched, not circinate or propoloid.

On dead leaves, South America.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Peru (NY-Pe 1138, Dpto. Junin, 11,000', Dumont, Carpenter, Buriticá, Sherwood, 9.VII.1976; Pe-1232, Dpto. Junin, Elev. 10,800', *Ibid.*).

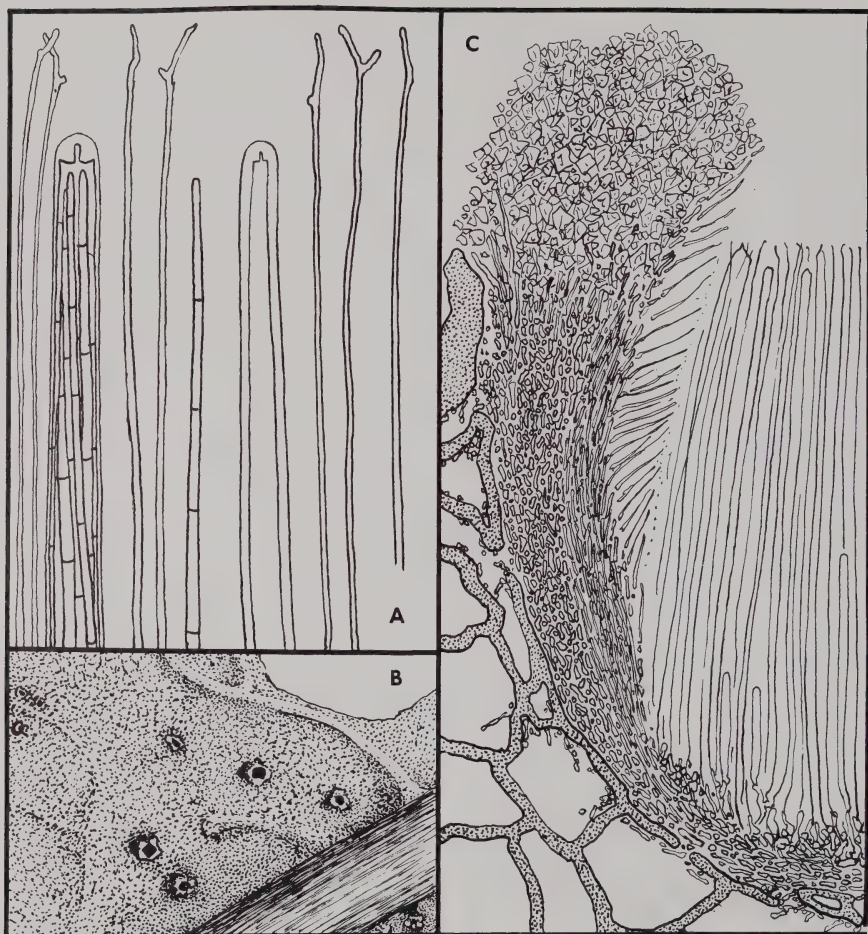


Figure 20. *Stictis hypophylla*. A. Detail of apices of asci, paraphyses, and spores, xl500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from NY-Co 3327.

- (6). *STICTIS IMMERSA* (Pass. ex Sacc.) Sherwood, comb. nov.
 ≡ *Schizoxylon immersum* Pass. ex Sacc., Syll. Fung. 8: 698 (1889)
 ≡ *Schizoxylon immersum* Pass. Diagn. Fung. Nov. 14
 (? unpublished)

Figure 21

Apothecia at first immersed, opening by a pore but not becoming erumpent, 0.3-0.5 mm broad, the margin entire, black without, with a dark grey, moderately pruinose border, the disc deeply immersed, dark brown, splitting away from the margin when dry. Accessory thalline margin prominent, c. 80 μ m thick, of widely-spaced brown non-carbonized hyphae.

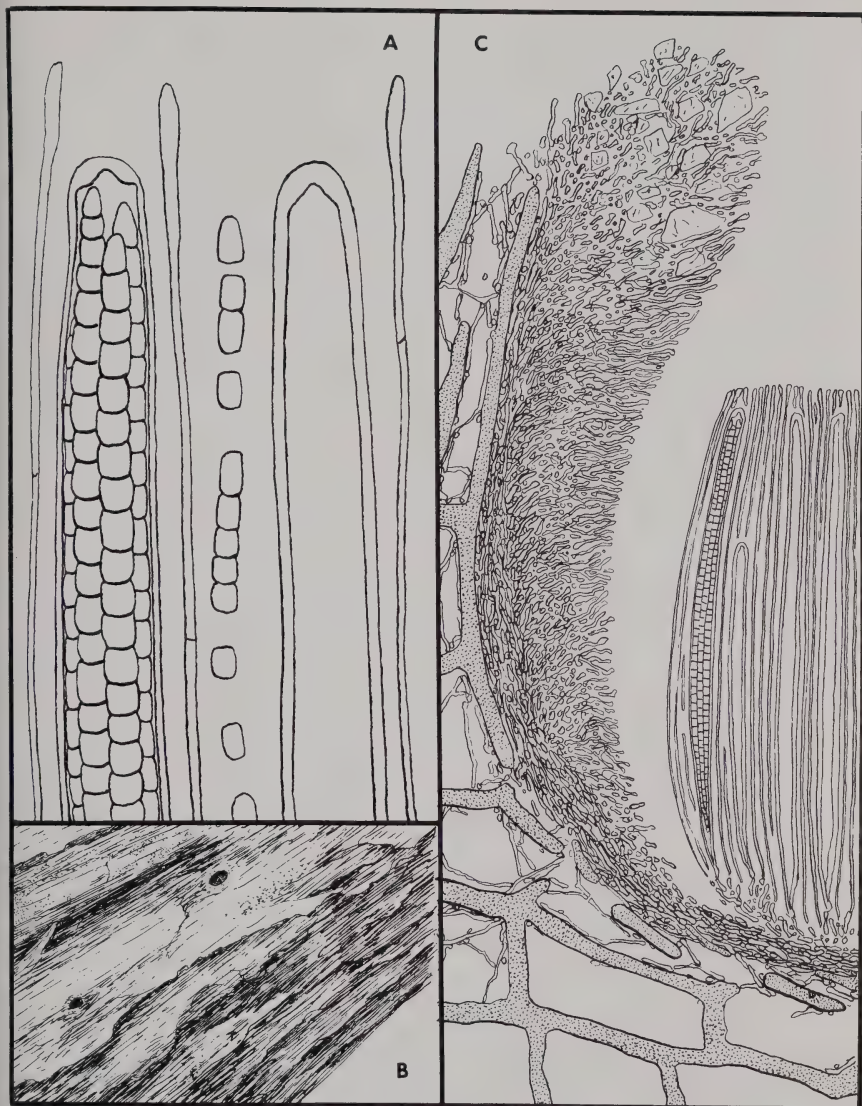


Figure 21. *Stictis immersa*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from CUP-D, Rehm Ascomyceten 1531.

1.5 μm diam., containing much included host material. Margin c. 50 μm thick, the wall 15 μm thick, of interwoven hyphae 1.5-2.0 μm diam., pale brown below, colorless above, continuing beneath the subhymenium for about half the diameter of the apothecium. Crystalline layer poorly developed.

Periphysoids unbranched to sparingly branched, c. $20 \times 1.5 \mu\text{m}$, J-, forming a compact layer. Paraphyses $180\text{--}200 \times 1.0 \mu\text{m}$, simple, slightly enlarged apically, the apex pale brown, J+ blue. Asci $175\text{--}200 \times 7\text{--}7.5 \mu\text{m}$, slightly thick-walled, the cap $2\text{--}2.5 \mu\text{m}$ thick, with a broad pore. Ascospores 8, nearly as long as the asci, $2.5\text{--}3 \mu\text{m}$ broad, constricted at the septa and tending to disarticulate to form simple part-spores $2\text{--}3 \mu\text{m}$ long.

On *Clematis vitalba*, Parma, Italy, according to Saccardo (1889), who cites the place of publication of the species as "Pass. Diagn. fung. nov. 14". Lindau and Sydow (1909) list six articles of that title published by Passerini between 1876 and 1892, but the species does not appear in any of them under *Schizoxylon* or a reasonable synonym. Saccardo's description may have been taken from unpublished manuscript notes. The species is at any rate validly published in the 8th volume of *Sylloge Fungorum*.

No specimen of *Schizoxylon immersum* remains in Passerini's herbarium (PARMA), and the only specimen in Saccardo's herbarium is from Rehm's Ascomyceten. Rehm's Ascomyceten 1531, from which the above description and Rehm's (1912) redescription of the species were taken, is neither type nor authentic material and has asci twice as long as were claimed by Saccardo (1889) for the species. Although possibly misidentified, it appears to be a distinct species of *Stictis*.

SPECIMEN EXAMINED: EUROPE: Germany (CUP-D 11886, auf dörren ranken von *Clematis vitalba* bei Hersching am Ammersee (Oberbayern) 8/1903, Dr. Rehm, Ascomyceten 1531).

(7). *STICTIS PARADOXA* Sherwood, spec. nov.

Figure 22

Ascocarpi primum immersi, non erumpescentes, profunde cupulati, $0.5\text{--}1.2 \text{ mm}$ diam., margine integro vel lacerato, disco pallide ochraceo. Margo in sectione transversali $35\text{--}50 \mu\text{m}$ crassus, siccus ab hymenio se abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, achromae, apice ad $2.0 \mu\text{m}$ incrassatae, in iodo non caerulescentes. Asci $375\text{--}400 \times 5\text{--}5.5\text{--}(6) \mu\text{m}$, apice $3.5\text{--}4 \mu\text{m}$ crassi, 8-spори. Sporae $325\text{--}375 \times 1.75\text{--}2.0 \mu\text{m}$, cellulis $3\text{--}5 \mu\text{m}$ longis.

HOLOTYPE: NY-Ve 3100, on unidentified twig, ravine ca. $80 \text{ km N. \& W.}$ of Barrancas, on Merida-Barrancas road, Edo. Barinas, Venezuela. K. P. Dumont, G. J. Samuels, L. Borjas. 26 July 1971. Isotypus: VEN.

Apothecia at first immersed, raising the substrate into small pustules but not becoming erumpent, opening by a pore, $0.5\text{--}1.2 \text{ mm}$ broad, the margin thick, buff-colored, entire to occasionally lacerate, the disc immersed, but not as deeply as in most species of *Stictis*, pale ochraceous, splitting away from the margin when dry. Margin in cross section $35\text{--}50 \mu\text{m}$ thick, predominantly crystalline, of colorless interwoven hyphae $1.5 \mu\text{m}$ diam.Periphysoidal layer indistinct. The conspicuous thalline margin accounts for most of the broad margin as seen from above. Subhymenium colorless, J-, of small, colorless, angular cells, $15\text{--}20 \mu\text{m}$ thick. Paraphyses numerous, filiform, colorless throughout, J-, enlarged to $2.0 \mu\text{m}$ at the apex, 1-2 times branched and cir-

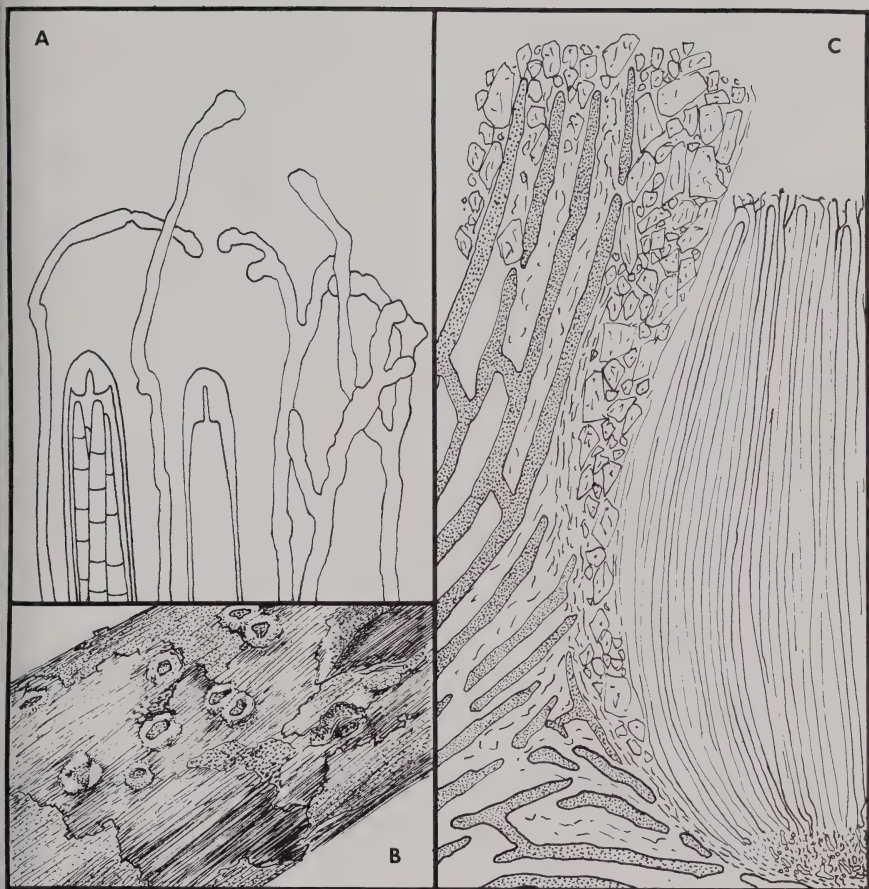


Figure 22. *Stictis paradoxa*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from NY-Ve 3100.

cinate, not greatly exceeding the asci in length or forming an epithecium. Asci $375-400 \times 5-5.5$ (-6) μm , the cap $3.5-4 \mu\text{m}$ thick, with a distinct pore. Spores 8, nearly as long as the asci, $1.75-2.0 \mu\text{m}$ broad, the cells $3-5 \mu\text{m}$ long, not disarticulating.

On wood, Venezuela. The margin, with poorly-developed wall and periphysoids, is quite different from that of *Stictis prominens* Sherw., which has a similar hymenium. *Sch. bellum* (Cke. & Kalchbr.) Sherw., an African species with non-disarticulating spores and similar hymenial dimensions, has a very thick wall. I have placed *S. paradoxa* in *Stictis* because of the immersed disc which splits away from the margin when dry, but the species may be transitional to species of *Schizoxylon* with colorless walls and non-disarticulating spores.

SPECIMEN EXAMINED: see holotype, above.

- (8). *STICTIS RADIATA* Pers., Obs. Mycol. 2: 73 (1799) var.
UNCINATA Phillips ex Sherwood, var. nov.
 = *Stictis radiata* var. *uncinata* Phill. in herb.

S. radiata var. *uncinata* a var. *typica* extrematibus sporarum ambabus uncinatis differt.

HOLOTYPE: COL-Dumont 6955, ca. 114 km. from Bucaramanga, on the Bucaramanga-Pamplona rd., Dto. Norte de Santander, Colombia. Elev. ca. 10,200'. K. P. Dumont, M. A. Sherwood, L. F. Velasquez, 21 August 1976. Isotypi: NY, CUP.

Stictis radiata var. *uncinata* differs from typical *S. radiata* in having spores which coil from both ends when released from the ascus. Phillips filed a specimen (cited below) and sketch under this name in his herbarium, but does not appear to have published the name. The coiling reaction was observed in lactophenol-cotton blue, Melzer's reagent, and KOH. With the possible exception of Phillips's specimen all of the collections cited were collected at high elevations. Long branched periphysoids 1.0 μ m broad refer this variety to *S. radiata* rather than to *S. stellata* Wallr., which is more common in the tropics and has not been observed to have coiling ascospores.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: Jamaica (K, Dr. Masters 5/85, Phillips's specimen of *S. radiata* var. *uncinata*). SOUTH AMERICA: Colombia (NY-Co 1820, Dpto. Cundinamarca, Dumont, Haines, Idrobo, 23.VII.1974; Co-6985; 6952; 6971, all from Dpto. Norte de Santander, Dumont, Sherwood, Velasquez, 21.VIII.1976; Co-6810, *Ibid.*, 20.VIII.1976; Co-5132, Dpto. Boyaca, Dumont, Sherwood, Carpenter, Molina, 13.VI.1976). Peru (NY-Pe 441, Dpto. Huanuco, Dumont, Carpenter, Sherwood, Buriticá, 2.VII.1976).

- (9). *STICTIS VENEZUELAE* Sherwood, spec. nov.

Figure 23

Ascomycetes primus immersi, profunde cupulati, 0.3-0.6 mm diam., margine integro, albo, disco pallide ochraceo. Margo in sectione transversali 50-75 μ m crassus, siccus ab hymenio se abruptens, hypharum pariete 2.0 μ m diam., achromo. Stratum crystallinum 20-40 μ m crassum.Periphysoides 15-20 x 2.0 μ m, non ramosa. Paraphyses filiformes, simplices vel ramosae, circinatae, apice non incrassatae, achromae, in iodo caerulescentes. Asci 240-280 x 7 μ m, apice 4 μ m crassi, 8-spori. Sporae 220-250 x 2.5 μ m, vagina gelatinosa involutae, cellulis 3-5 μ m longis.

HOLOTYPE: NY-Ve 656, on unidentified twig, trail between Rio Chiquito and Rio Grande, above La Plata, Mt. La Naiguita, Dpto. Federal, Venezuela. Dumont, Haines, & Manara, 25 June 1971. Isotypus: VEN

Apothecia immersed, opening by a pore, 0.3-0.6 mm diam., the margin white, entire, the disc deeply immersed, pale ochraceous, splitting away from the margin when dry. Accessory thalline margin not prominent. Wall 25 μ m thick, of interwoven colorless hyphae 2.0 μ m diam., not notably gelatinous, appearing somewhat pseudoparenchymatous. Crystalline layer distinct, narrow. Periphysoids 15-20 x 2.0 μ m,

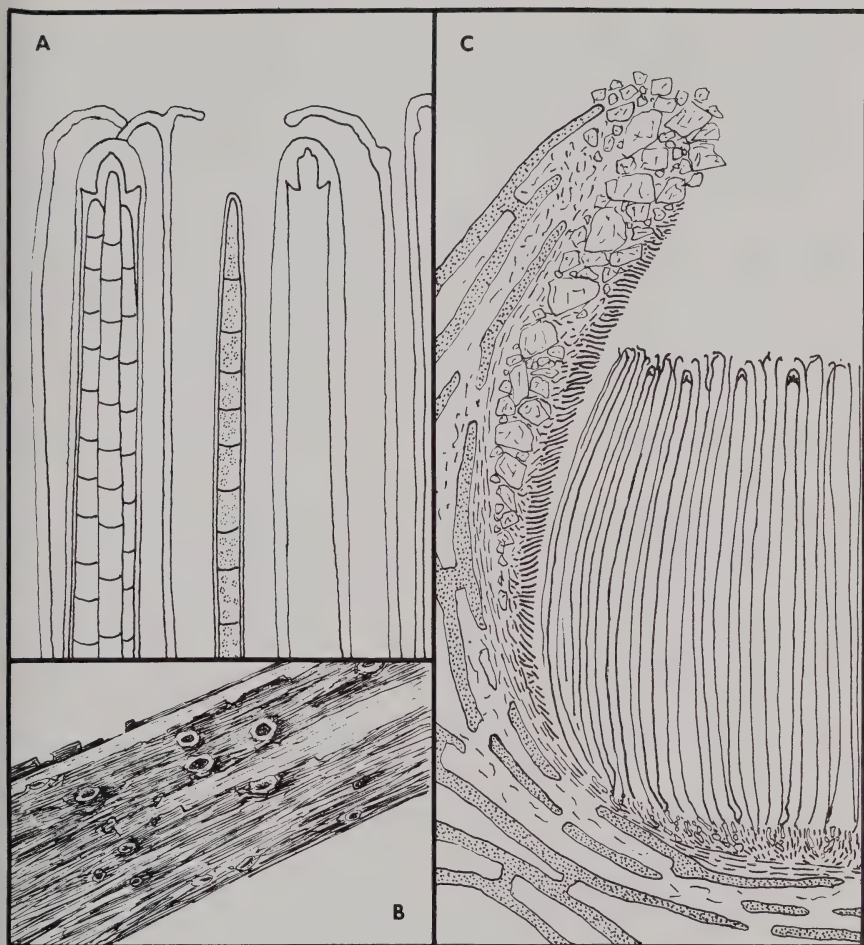


Figure 23. *Stictis venezuelae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x 225. Drawn from NY-Ve 656.

unbranched, not gelatinous, forming a compact layer. Paraphyses filiform, branched and circinate, generally not thickened above, J+ blue. Asci 240-280 x 7 μm , the cap 4 μm thick, pierced by an angular pore. Ascospores 8, nearly as long as the asci, 2.5 μm broad, sheathed, the cells 3-5 μm long.

On twigs, South America. *S. prominens* Sherw. has a much thicker wall, and longer, narrower, branched periphysoids. Longer, broader, sheathed spores and circinate paraphyses distinguish *S. venezuela* from *S. stellata*.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Colombia (NY-Co 7526, Dpto. Risaralda, Dumont & Molina, 27.VIII.1976)

ACKNOWLEDGEMENTS

The author wishes to express a debt of gratitude to the many individuals and institutions who have made this study possible. Thanks are expressed to the directors and staff of the following herbaria for processing loans and making available the specimens on which this study was based: B, BPI, BURNLEY, COL, CUP, FH, H, K, LPS, NY, S, TUR, S, ZT. The author was able to collect fungi in South America under grant GB-28593 to K. P. Dumont (NY) and in the Canary Islands under NSF grant DEB75-23557 to R. P. Korf (CUP). The study was supported primarily by the bequest of Anna Jenkins to the CUP herbarium. R. P. Korf kindly assisted in manuscript preparation and offered many helpful suggestions. W. J. Dress (BH) assisted in preparing the Latin diagnoses.

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MYCOTAXON

Vol. VI, No. 2, pp. 261-276

October-December 1977

NOTES ON HYPHOMYCETES. XX. "CERCOSPORA-COMPLEX" FUNGI OF *CASSIA* AND *PSORALEA*.

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ABSTRACT

Seven species of hyphomycetes originally classified in *Cercospora* Fres. occurring on *Cassia* and *Psoralea* are redescribed and illustrated. One, *C. chamaecrista* Ell. and Kellerm., is accepted as satisfactorily classified in its original genus; one, *C. cassiae* P. Henn., in *Cercosporidium* Earle; one, *C. occidentalis* Cooke in *Phaeoramularia* Mutanola; one, *C. greciana* H. Syd., is reclassified in *Mycovellosiella* Rangel and three, *C. angustata* Chupp and Solheim, *C. nigricans* Cooke and *C. simulata* Ell. and Everh., are reclassified in *Phaeoisariopsis* Ferraris.

INTRODUCTION

Twenty specific epithets have been proposed in the genus *Cercospora* to accommodate fungi occurring on members of *Cassia* L. and *Psoralea* L. Examination of type collections on which nineteen of these are based has indicated that eleven can be accepted as valid. One is best regarded as a *nomen dubium*. Seven are considered to be facultative nomenclatural synonyms. No decision has been made concerning two epithets since type material has not been seen.

Brown and Morgan-Jones (1976) redescribed and illustrated four of these fungi listing two epithets as synonyms. Two species were reclassified in *Cercosporidium* and one each in *Passalora* and *Phaeoisariopsis*. In the present paper seven species are redescribed and illustrated. Six epithets are listed as synonyms. One species is retained as appropriately classified in *Cercospora*, one is reclassified in *Mycovellosiella* and three in *Phaeoisariopsis*. Two of the species have

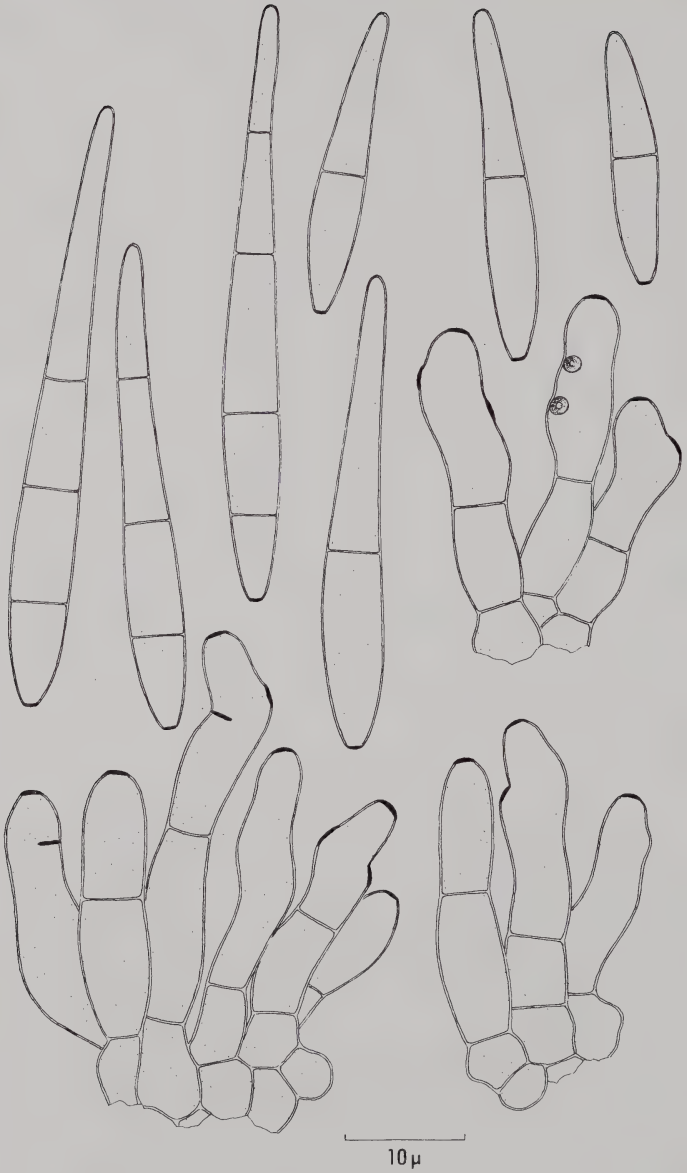


FIGURE 1. *Cercospora chamaecrista*
Conidiophores and conidia.

previously been transferred out of *Cercospora* into *Cercosporidium* and *Phaeoramularia* by Deighton (1967) and Deighton in Ellis (1976), respectively.

TAXONOMIC PART

Cercospora chamaecrista Ellis and Kellerman, J.
Mycol. 4:7, 1888 (Fig. 1).

Leaf spots indistinct, brown; leaf tissue appearing scorched. Colonies hypophyllous, effuse, occasionally spreading over most of the abaxial surface of the leaf. Mycelium immersed in the substratum, composed of branched, septate, pale brown, 3 - 4 μ wide hyphae. A few prosenchymatous, pale brown cells aggregate in the substomatal cavities and give rise to loose fascicles of conidiophores. Conidiophores macronematous, mononematous, emerging through the stomata, simple, straight, smooth, relatively thick-walled, cylindrical to subclavate, 0 to 2-septate, constricted slightly at the septa, apex obtuse, pale olivaceous brown, conidial scars prominent, 15 - 70 X 4 - 7 μ . Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, subhyaline to very pale brown, straight or slightly curved, narrowly obclavate, base somewhat truncate, 1 to 8-septate, basal scars prominent, 15 - 55 X 5 - 7 μ .

On leaves of *Cassia chamaecrista* L; North America.

Collection examined: on *C. chamaecrista*, Manhattan, Kansas, October 1887, W. A. Kellerman no. 1126, NY, type.

The conidiophores of *C. chamaecrista* are similar in size and morphology to those of *C. apii* Fres., the type species of *Cercospora*. The broader, more obclavate conidia distinguish *C. chamaecrista*.

Cercosporidium cassiae (P. Henn.) Deighton, C.M.I.
Mycol. Pap. 112:66, 1967 (Fig. 2).

= *Cercospora cassiae* P. Hennings, Bull. Herb.
Bossier 1:121, 1893.

= *Berteromyces anaeus* Ciferri, Sydowia
8:267, 1954.

Leaf spots dark brown, generally orbicular, sometimes irregular, individual spots up to 3mm wide, frequently coalescent, occasionally surrounded by a yellow halo, often delimited by leaf veins. Colonies amphigenous but mostly hypophyllous, bearing dark olivaceous, dense, pustular fascicles that sometimes occur outside the leaf spot. Mycelium immersed,

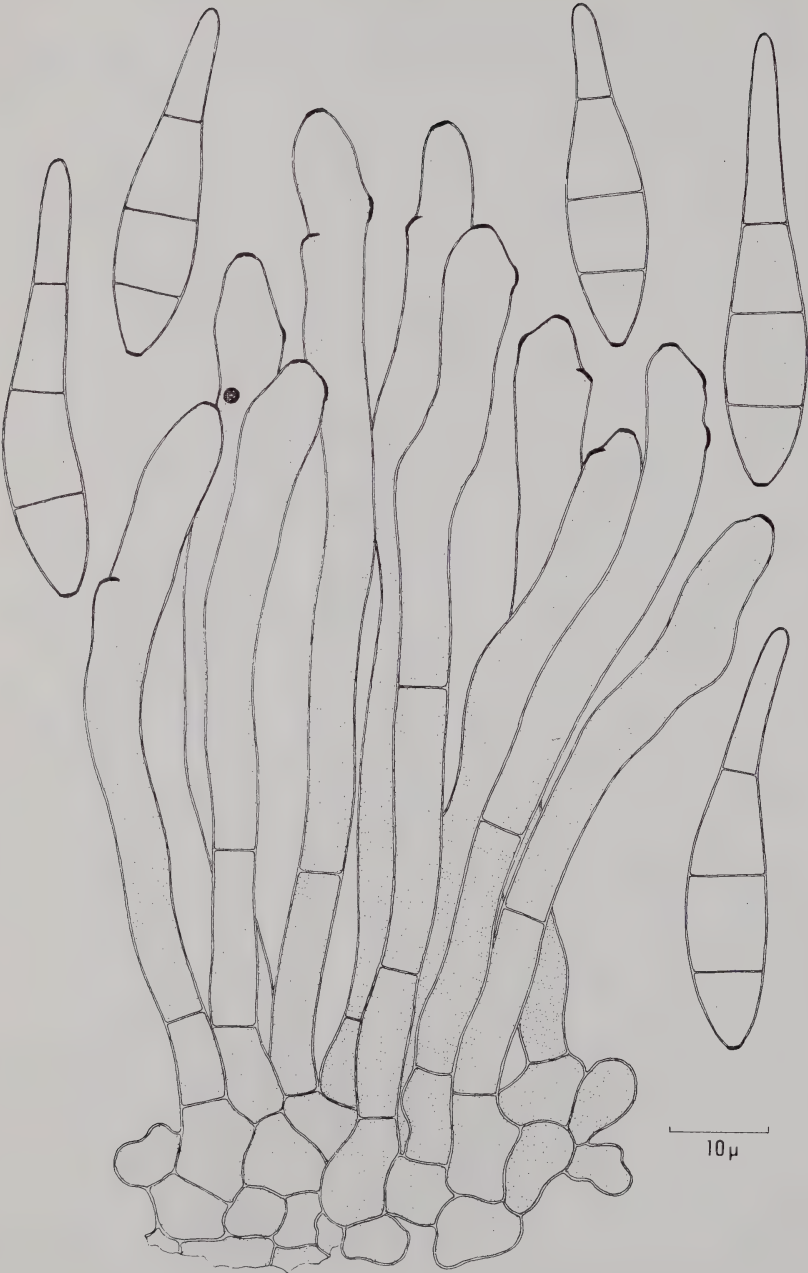


FIGURE 2. *Cercosporidium cassiae*.
Conidiophores and conidia.

subhyaline, branched, septate, 2 - 3 μ wide. Stromata composed of tightly appressed, hyaline cells, substomatal, 50 - 75 μ wide, about 15 μ thick below the densely crowded conidiophore bases. Conidiophores macronematous, monone-matous, numerous, fasciculate, erect, straight or flexuous, pale olivaceous brown, paler above, 1 to 3-septate, cylindrical, usually broader towards the apex, conidial scars distinct, markedly thickened, 70 - 130 X 3.5 - 5 μ , occasionally up to 10 μ wide distally; conidial scars frequently situated on a small shoulder at an angle to the axis. Conidiogenous cells polyblastic, integrated, terminal sympodial. Conidia solitary, dry, acropleurogenous, straight, to slightly curved, occasionally rostrate, apex obtuse, 0 to 4-septate, pale olivaceous brown, 27 - 65 X 8 - 11.5 μ , with a distinct thickened basal scar.

On leaves of *Cassia* spp.; Africa, North America, West Indies.

Collection examined: on *C. goratensis* Fres., nr. Akur, Eritrea, Ethiopia, March 5, 1892, G. Schweinfurth no. 777, B, type.

This fungus has been reported to occur on eight other species of *Cassia* (Deighton, 1967).

Mycovellosiella greciana (H. Syd.) comb. nov.
(Fig. 3).

= *Cercospora greciana* H. Sydow, Ann. Mycol. 23: 426, 1925.

Leaf spots indistinct. Colonies effuse, dense, hypophyllous, sometimes delimited by the leaf veins, brown to dark brown. Mycelium superficial or immersed in the substratum; immersed mycelium branched, septate, pale olivaceous brown, 6 - 7 μ wide, superficial mycelium similar but hyphae usually slightly constricted at the septa. Conidiophores macronematous, mononematous, arising from the superficial hyphae terminally or as small lateral branches, smooth, relatively thick-walled, straight or slightly flexuous, cylindrical, somewhat broader towards the apex, septate, sometimes mildly geniculate, mid olivaceous brown, paler above, 20 - 73 X 5 - 7 μ , bearing distinct scars. Conidiogenous cells polyblastic, terminal, integrated, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, cylindrical to narrowly obclavate, usually curved, smooth, thick-walled, pale to mid olivaceous brown, 0 to 14-septate, basal scars distinct, truncate, 22 - 108 X 6 - 8 μ .

On leaves of *Cassia oxyphylla* Kunth; Central America.

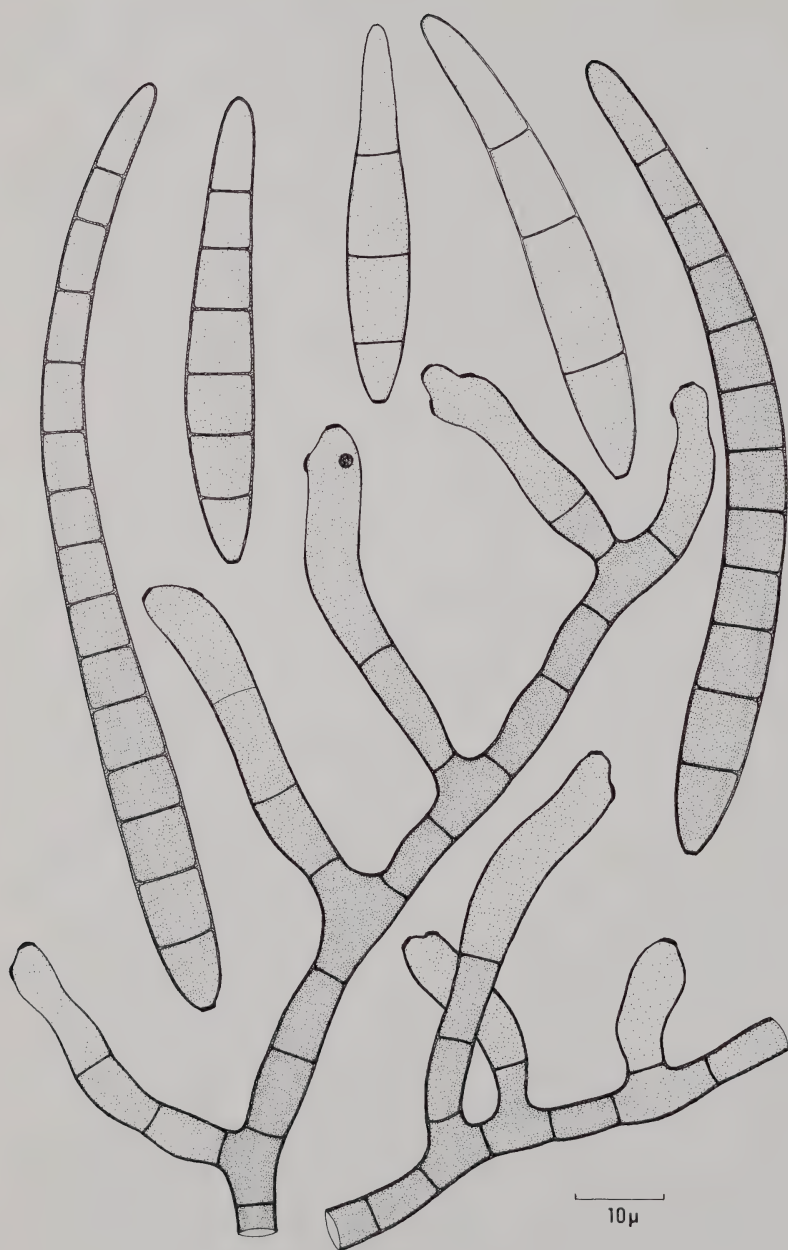


FIGURE 3. *Mycovellosiella greciana*.
Conidiophores and conidia.

Collection examined: on *C. oxyphylla*, Grecia, Costa Rica, January 19, 1925, H. Sydow, Fungi exotici exsiccati no. 710, S, type.

Chupp (1953) suggested that this species might be placed in *Helminthosporium* Link ex Fr. on account of its colored conidiophores and thick-walled conidia. Clearly this suggestion can not be taken up. The fungus has all the characteristics of *Mycovellosiella*. The presence of assurgent conidiophore-bearing superficial hyphae is characteristic as is a tendency for the hyphae and conidiophores to intertwine.

Phaeoisariopsis angustata (Chupp and Solheim) comb. nov. (Fig. 4).

≡ *Cercospora angustata* Chupp and Solheim, apud Chupp, A monograph of the fungus genus *Cercospora*, 280, 1953.

Leaf spots brownish to grayish, 0.5 to 3mm in diameter, angular, on dried leaves almost invisible. Colonies effuse, amphigenous, brown. Mycelium immersed in the substratum, composed of branched, septate, subhyaline to very pale brown hyphae, 2 - 4 μ wide. Stromata immersed, sometimes partly exposed, prosenchymatous, brown, subglobose to somewhat irregular, up to 40 μ wide. Conidiophores macronematous, mononematous, fasciculate, simple, straight or flexuous, subhyaline to pale olivaceous brown, cylindrical, base somewhat inflated 0 to 1-septate, smooth, scars indistinct, 10 - 50 X 2 - 3.5 μ . Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, dry, solitary, acropleurogenous, straight or moderately curved, cylindric to very narrowly obclavate, subhyaline to very pale olivaceous brown, base truncate, scars indistinct, 15 - 75 X 2 - 4 μ .

On leaves of *Cassia hirsuta* L; South America.

Collection examined: on *C. hirsuta*, Finca "Las Cana", south of Jamundi, Colombia, May 15, 1929, C. E. Chandon and J. Nolla no. 269, CUP.

The conidiophores and conidia of *P. angustata* do not possess the distinct scars characteristic of *Cercospora*. It is perhaps not ideally classified in *Phaeoisariopsis* but a more satisfactory generic home for it is unavailable.

Phaeoisariopsis nigricans (Cooke) comb. nov. (Fig. 5).

≡ *Cercospora nigricans* Cooke, Grevillea 12:30, 1883.

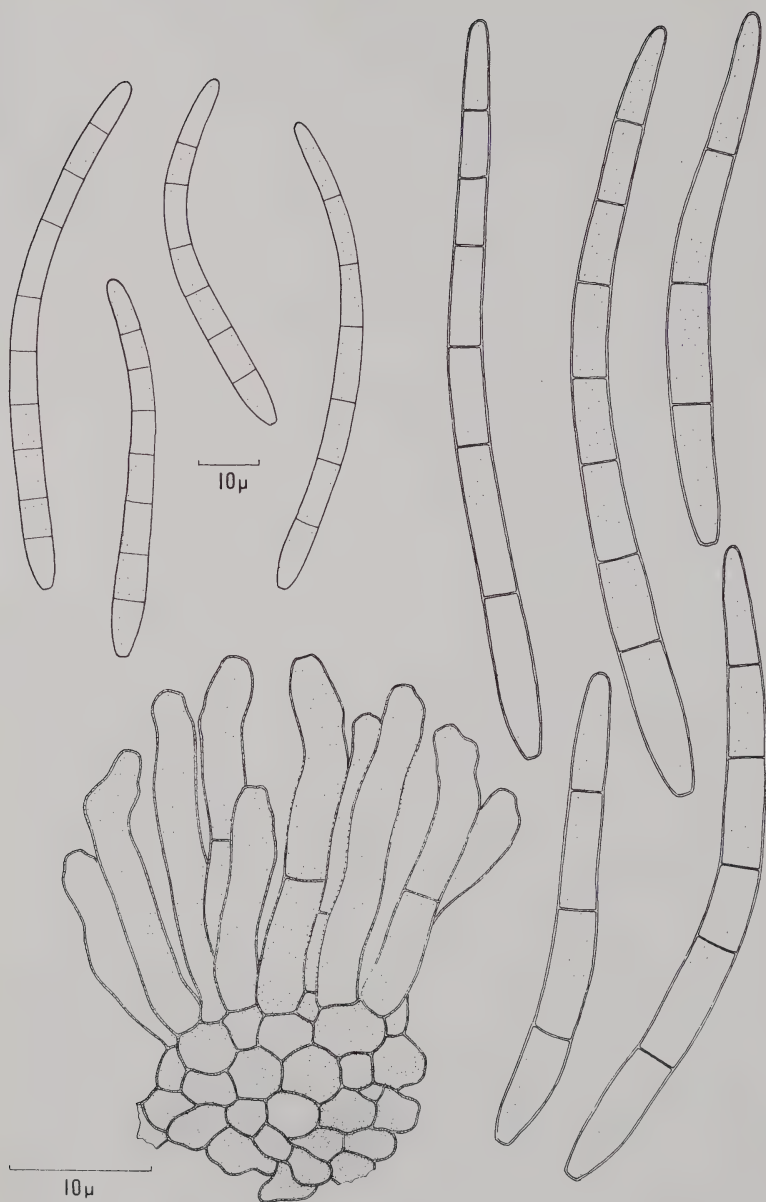


FIGURE 4. *Phaeoisariopsis angustata*.
Conidiophores and conidia.

= *Cercospora atromaculans* Ellis and Everhart, J. Mycol. 3:17, 1887.

= *Cercospora torae* Tharp, Mycologia 9:115, 1917.

Leaf spots indefinite at first, later becoming grayish brown, orbicular, up to 1cm in diameter. Colonies effuse. Mycelium immersed in the substratum, composed of branched, septate, pale brown hyphae, 3 - 4 μ wide. Stromata immersed, substomatal, prosenchymatous, consisting of a few to several cells, olivaceous brown to brown. Conidiophores macronematous, mononematous, in loose fascicles, amphigenous or more often epiphyllous, occasionally branched, straight to slightly flexuous, geniculate above, smooth, pale brown, paler towards the tip, cylindrical, slightly broader towards the apex, 2 to 6-septate, bearing indistinct conidial scars, 30 - 100 X 4 - 5 μ . Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, straight to slightly curved, narrowly obclavate to cylindrical, very pale brown, 3 to 5-septate, somewhat truncate at the base, 18 - 80 X 3 - 5 μ .

On leaves of *Cassia* spp.; North America, South East Asia, West Indies.

Collections examined: on *C. obtusifolia* L.; Aiken, South Carolina, November 1881, W. H. Ravenel no. 4023, K, type; on *C. tora* L., Natchitoches, Louisiana, September 23, 1886, A. B. Langlois no. 707, NY (type of *C. atromaculans*); on *C. tora* L., Palestine, Texas, October 30, 1914, Lewis and Tharp, BPI (type of *C. torae*).

Phaeoisariopsis simulata (Ell. and Everh.) comb. nov. (Fig. 6).

= *Cercospora simulata* Ellis and Everhart, J. Mycol. 1:64, 1885.

Leaf spots indistinct. Colonies hypophyllous, effuse, olivaceous brown. Mycelium immersed in the substratum, composed of branched, septate, subhyaline to pale brown, 3 - 4.5 μ wide hyphae. A few hyphae composed of inflated, subhyaline cells aggregate in substomatal cavities and give rise to fascicles of conidiophores. Conidiophores macronematous, mononematous, fasciculate, simple, lower third straight to slightly flexuous, upper two thirds flexuous to geniculate, smooth, olivaceous brown, paler above, cylindrical, frequently slightly bulbous at the base, broader near the apex, septate, conidial scars indistinct, 140 - 300 X 3 - 4 μ . Conidiogenous cells polyblastic, integrated, terminal or intercalary, somewhat denticulate, sympodial. Conidia

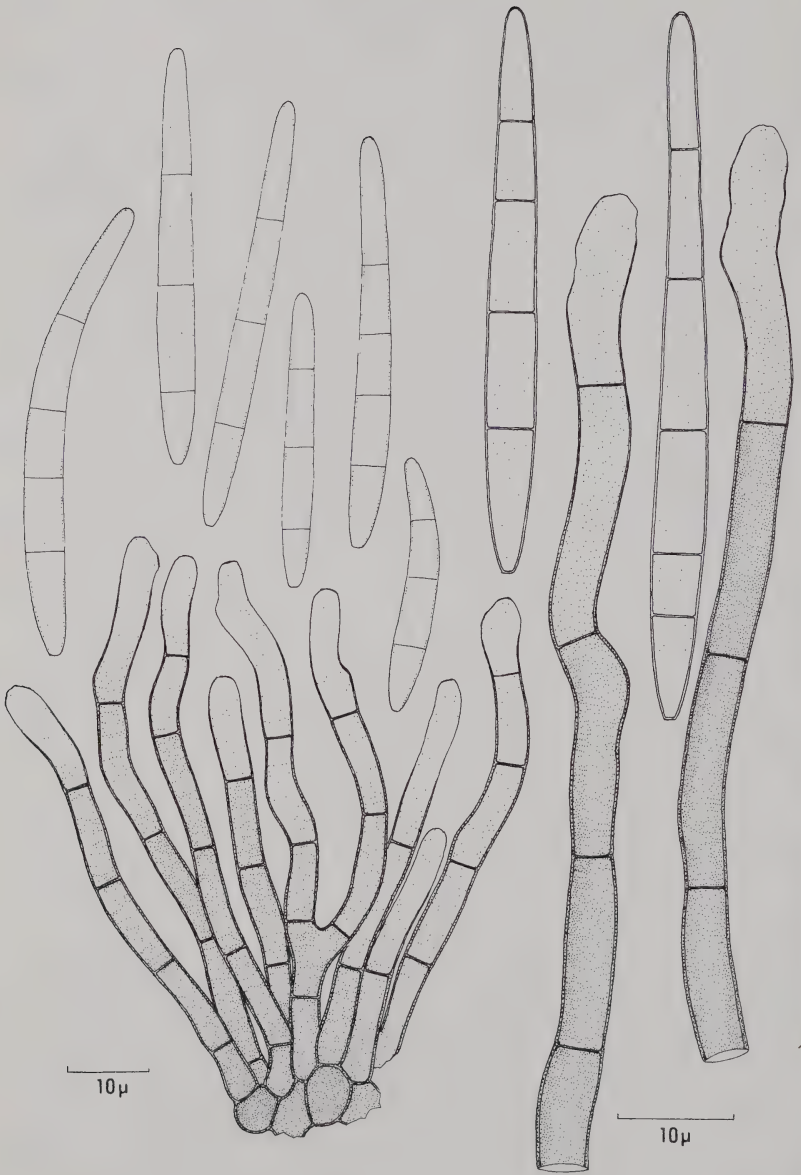


FIGURE 5. *Phaeoisariopsis nigricans*.
Conidiophores and conidia.

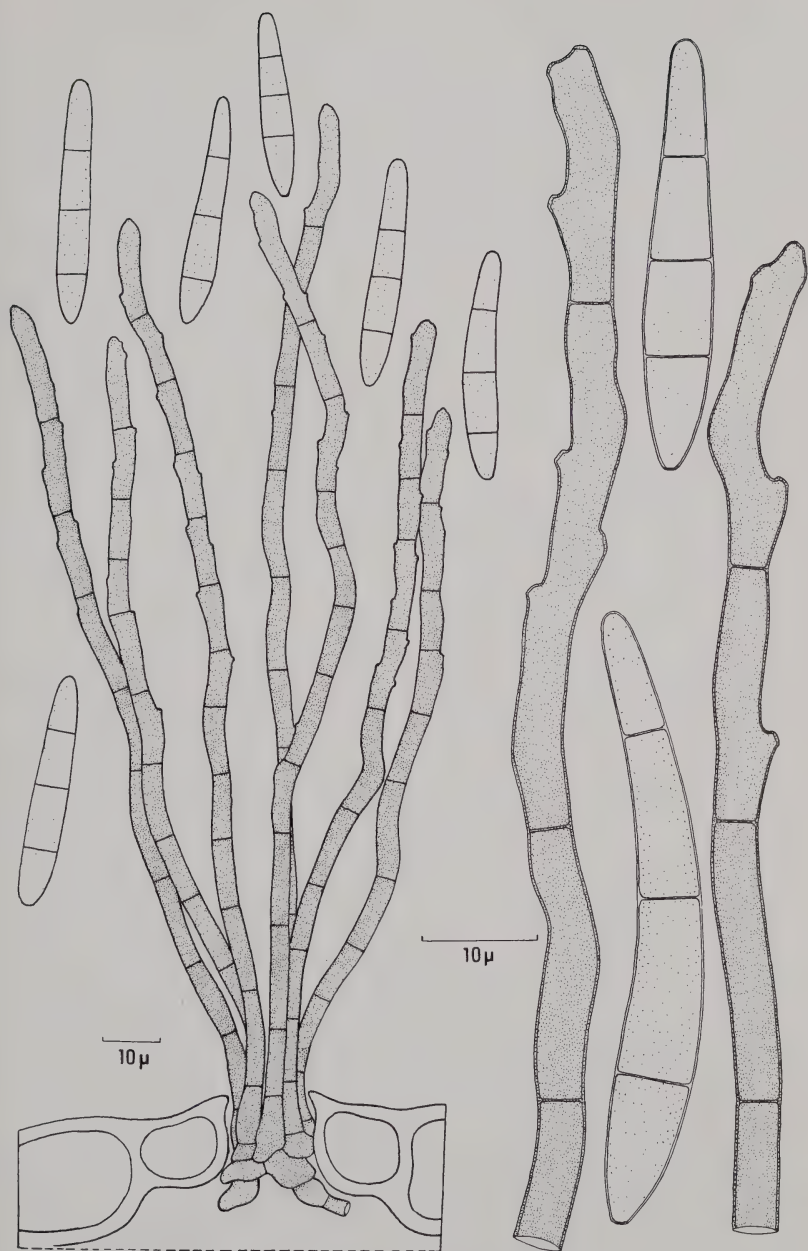


FIGURE 6. *Phaeoisariopsis simulata*.
Conidiophores and conidia.

holoblastic, solitary, dry, acropleurogenous, straight or gently curved, narrowly obclavate to cylindrical, somewhat truncate at the base, subhyaline to very pale brown, 1 to 3-septate, 20 - 45 X 4 - 5 μ .

On leaves of *Cassia* spp.; Europe, North and South America, West Indies.

Collection examined: on *C. marylandica* L., Pine Hills, Union County, Illinois, September 22, 1884, F. S. Earle no. 117, NY, type.

Chupp (1953) records this species as occurring on *C. alata* L.

The relatively long, flexuous conidiophores bearing indistinct, unthickened conidial scars indicate affinity with *Phaeoisariopsis* rather than with *Cercospora*.

Phaeoramularia occidentalis (Cooke) Deighton apud Ellis, More Dematiaceous Hyphomycetes, Commonwealth Mycological Institute, 322, 1976 (Fig. 7).

= *Cercospora occidentalis* Cooke, Hedwigia 17:39, 1878.

= *Cercosporina occidentalis* (Cooke) Saccardo, Syll. Fung. 25:906, 1931.

= *Cercospora paulensis* P. Hennings, Hedwigia 48:18, 1909.

= *Cercospora occidentalis* Ellis and Kellerman apud Heald and Wolf, USDA Bur. Plant Ind. Bull. 226:101, 1912.

= *Ramularia cassiaecola* Heald and Wolf, USDA Bur. Plant Ind. Bull. 226:101, 1912.

= *Cercospora somalensis* Curzi, Bol. R. Staz. Patol. Veget. n.s. 12:158, 1913.

Leaf spots raised, orbicular or irregular in shape, cream to brownish, center sunken with a pale brown to brown border, sometimes coalescing, up to 40mm wide. Colonies limited, amphigenous, brown. Mycelium immersed in the substratum, composed of branched, septate, pale brown, 3 - 4 μ wide hyphae. Stromata subglobose or somewhat flattened, composed of hyphae made up of swollen, pale brown cells closely appressed, 10-45 μ wide. Conidiophores macronematous, mononematous, fasciculate, emerging through the stomata, simple, straight or curved, cylindrical, smooth, slightly inflated above, pale to mid brown, 0 to 1-septate, conidial scars distinct,

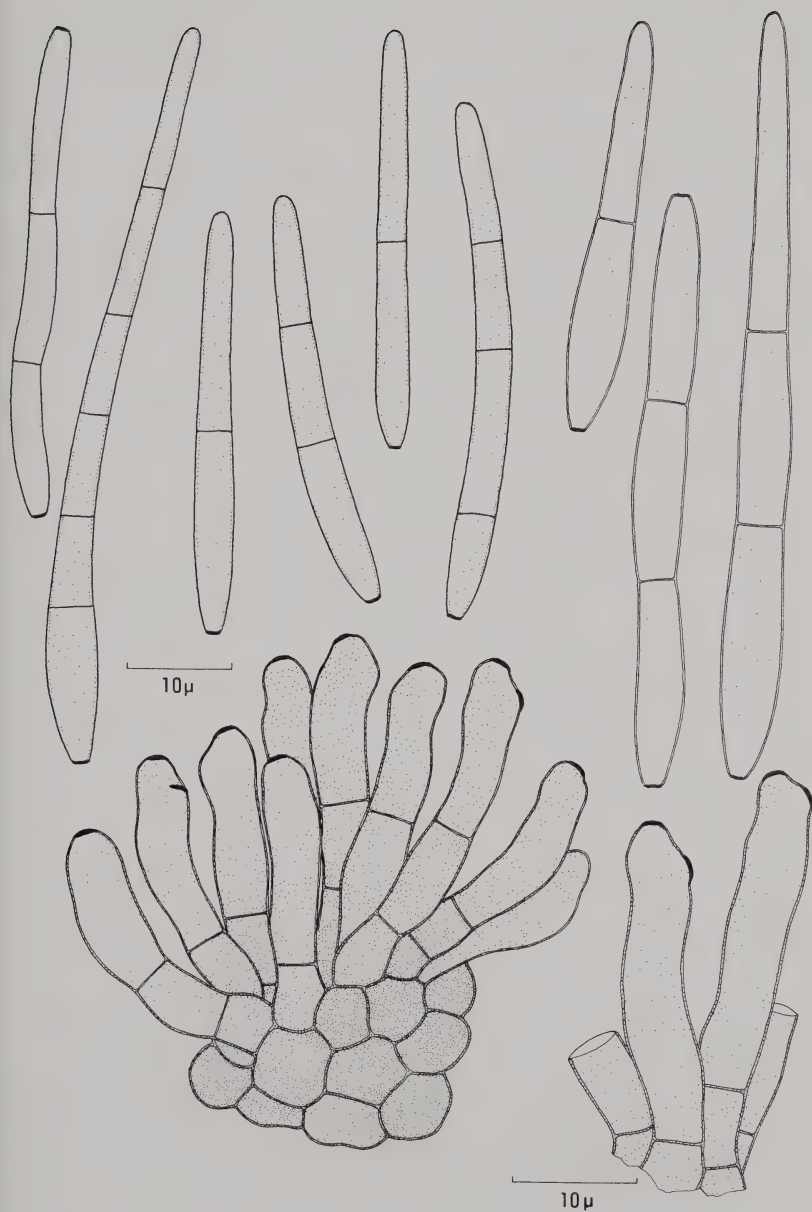


FIGURE 7. *Phaeoramularia occidentalis*.
Conidiophores and conidia.

8 - 40 X 4 - 6 μ . Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary or catenate, dry, acropleurogenous, straight or curved, cylindrical, slightly wider at the base, pale olivaceous brown, smooth, 1 to 6-septate, 30 - 140 X 4 - 7 μ .

On leaves of *Cassia occidentalis* L.; North and South America, West Indies.

Collections examined: on *C. occidentalis*, Aiken, South Carolina, 1876, H. W. Ravenel, Fungi Am. Exsiccati 65, BPI, type; on *C. occidentalis*, Auburn, Lee County, Alabama, September 28, 1896, F. S. Earle, NY; on *Cassia* sp., Iponema, Sao Paulo, Brazil, November 4, 1903, P. Hennings, BPI (type of *C. paulensis*); on *C. occidentalis*, Cuero, Texas, September 3, 1909, F. D. Heald and F. A. Wolf, BPI (type of *Ramularia cassiaeicola*); on *C. occidentalis*, Stockdale, Texas, September 4, 1911, F. D. Heald and F. A. Wolf, BPI.

NOTES ON OTHER SPECIES

Cercospora psoraleae-bituminosae Savulescu and Sandu-Ville, Mem. Sec. St. Acad. Rom., ser. 3, 15:485, 1940.

An examination of the holotype of *Cercospora psoraleae* Ray (on *Psoralea digitata* Nutt., College Nursery, Stillwater, Oklahoma, U.S.A., March 7, 1940, W. W. Ray, CUP) which Constantinescu (1975) lists as a facultative synonym of *C. psoraleae-bituminosae*, shows it to be conspecific with *Cercosporidium cassiocarpum* (Sacc.) Brown and Morgan-Jones. The following names have been applied to this fungus:

Cercosporidium cassiocarpum (Sacc.) Brown and Morgan-Jones, Mycotaxon 4:299, 1976.

= *Cercospora occidentalis* Cooke var. *cassiocarpa* Saccardo, Ann. mycol. 11:557, 1913.

= *Cercospora cassiocarpa* (Sacc.) Chupp, A monograph of the fungus genus *Cercospora*, 290, 1953.

= *Cercospora latens* forma *europaea* Fragosa, Boln. R. Soc. Esp. Hist. Nat. 21:97, 1921.

= *Cercospora europaea* (Frag.) O. Const., Revue Mycol. 32:106, 1967.

= *Cercospora psoraleae-bituminosae* Savulescu and Sandu-Ville, Mem. Sec. St. Acad. Rom., ser. 3, 15:485, 1940.

= *Cercospora psoraleae* Ray, Mycologia 33:176, 1941 non *C. psoraleae* Petrak, Sydowia 4:572, 1950.

A detailed description and illustration of this fungus was published by Brown and Morgan-Jones (1976). *Cercospora canescens* Ellis and Martin is a similar fungus known to occur on a variety of leguminaceous hosts. Ellis (1976) records it on *Cassia*. It seems possible that *C. cassiocarpum* might be the same as *C. canescens* but examination of the type of the latter is needed to ascertain this. If they should be found to be conspecific the name *C. canescens* has priority.

Cercospora cassiaeicola Roumeguere, Fungi selecti exsiccati 4866.

Examination of its type material (on leaves of *Cassia* sp., Cordillere de Peribebuy, Paraguay, March 1883, B. Balansa, NY) has revealed the collection to be in too poor a condition to permit evaluation. Chupp (1953) notes that a second packet in herb. FH is in a similar condition and that a third packet in herb K contains a piece of thick bark. It seems advisable to list this name as a *nomen dubium*.

Cercospora lambareneensis Yeh, Cah. La Maboque 9:33, 1971.

This was described from a collection on *C. occidentalis*. We have not examined the type.

Cercospora pinnulaecola Atkinson, J. Elisha Mitchell Sci. Soc. 8:64, 1892.

This was described from a collection on *C. nictitans* L. We have not examined the type.

ACKNOWLEDGEMENT

We thank the curators of the herbaria at Beltsville, Berlin, Ithaca, Kew, New York and Stockholm for making available for examination collections in their keeping.

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MYCOTAXON

Vol. VI, No. 2, pp. 277-336

October-December 1977

LES GENRES *DICHOSTEREUM* ET *VARARIA* EN GUADELOUPE (BASIDIOMYCETES, LACHNOCLADIACEAE)

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RESUME

Descriptions are given of *Dichostereum peniophoroides*, *Vararia dussii* n. sp., *V. gomezii*, *V. intricata*, *V. minidichophysa*, *V. minispora* n. sp., *V. rhombospora* n. sp. and *V. tropica*. Cultural characters are given for all these species which occur in Guadeloupe, excepting *V. minidichophysa* for which the data has been published elsewhere, and *V. tropica*. Species of *Dichostereum* always are shown to be tetrapolar and to have a *Spiniger* stage. Autonomy of *D. peniophoroides* is confirmed as a result of its intersterility with other species, but interfertility of strains of *V. dussii* is demonstrated despite differences in spore size, and likewise interfertility of 5 strains of *V. intricata* with variable gloeocystidial characters. A key is provided to all species of *Vararia* occurring in Central America.

Un bref séjour en 1975, puis trois semaines de récoltes et d'études intensives des Aphyllophorales en septembre-octobre 1976 nous permettent d'apporter une première contribution à la connaissance de la Flore mycologique guadeloupéenne.

Afin de comparer, d'identifier ou de distinguer nos récoltes africaines, nous avons été amenés à étudier

de nombreuses espèces de *Vararia* subg. *Vararia* décrites du monde entier et avons donné de chacune une description illustrée (1976). Mais il n'avait pas été possible d'étudier alors les *Vararia* d'Amérique du Sud. Si depuis nous avons pu obtenir le prêt de deux espèces décrites par Viêgas (1945), il ne nous a toujours pas été permis de disposer des espèces de J. Rick, malgré des demandes répétées. Il nous paraît hautement regrettable que l'accès à certaines collections soit rendu impossible aux spécialistes. Peut-être faudrait-il suggérer aux Comités internationaux de nomenclature de prendre des mesures, si nécessaire draconiennes, pour assurer l'accès à des collections qui, après publication, appartiennent en fait au patrimoine scientifique international. Nous aurions dû différer indéfiniment cette mise au point si notre collègue P.L. Lentz, directeur des "National Fungus Collections" américaines (Beltsville, Maryland), qui a eu la possibilité d'étudier antérieurement les *Vararia* de Rick, n'avait eu l'amabilité de nous faire savoir que nos descriptions illustrées ne correspondaient à aucune des espèces de J. Rick.

Malgré une prospection encore sommaire, il apparaît que le genre *Vararia* est bien représenté en Guadeloupe. Certaines récoltes ont pu être identifiées à des espèces décrites d'Amérique Centrale (*Vararia*(*Dichostereum*) *peniophoroides*, *V. tropica*), d'autres à des espèces d'Amérique du Sud (*V. gomezii*) ou même d'Afrique tropicale (*V. minidichophysa*, *V. intricata*), d'autres enfin doivent être considérées comme nouvelles (*V. rhombospora*, *dussii*, *minispora*). Comme nous l'avons fait dans la mise au point de 1976, nous donnerons une description illustrée des *V. splendida* et *ubatubensis* (Viêgas 1945) espèces brésiliennes apparentées respectivement à *V. intricata* et *V. minispora*, regrettant une fois encore de ne pouvoir être plus complets à défaut de l'étude des spécimens de J. Rick.

Aucune espèce Nord-Américaine tempérée n'a été récoltée. Nous ne reprendrons pas l'étude d'espèces que Welden (1965) a décrites des Caraïbes et que nous n'avons pas rencontrées ; elles ont été illustrées dans notre mise au point précédente (1976) ; ce sont *V. fibra* Welden, de Jamaïque, et *V. trinidadensis* Welden (ut *trinidadense*) de Trinidad. Cet auteur signale en outre *V. pallescens* à Grenada, *V. investiens* à Porto-Rico, St Kitts et Jamaïque, *V. pectinata* en Dominique et au Surinam, et *V. phyllophila* en Jamaïque. Les citations *V. investiens* et de *V. pectinata* ne sont pas à retenir ; pour ce dernier voir à *V. splendida*.

L'accueil reçu à la Station de Pathologie végétale du Centre de Recherches Agronomiques des Antilles et de la Guyane de l'I.N.R.A. à Petit-Bourg (Guadeloupe) nous a permis non seulement l'étude journalière dans de bonnes conditions du matériel récolté et l'obtention de sporées, mais aussi la mise en culture polysperme et l'isolement de monocaryons. Les caractères cultureux pourront donc être décrits pour la presque totalité des espèces signalées, et notamment pour toutes les espèces proposées comme nouvelles. Pour les conditions d'observation et l'expression des résultats, le lecteur se reportera à J. Boidin (1958), pour le décryptage du Code à Nobles (1965) et aux compléments proposés par J. Boidin (1966) et P. Lanquetin (1973 b). Les milieux de montage des préparations seront indiqués dans les légendes des figures sauf pour les cultures toujours observées dans le Rouge Congo ammoniacal à froid.

Rappelons que, sauf pour les spécimens d'herbier reçus en prêt, les spores sont toujours observées sur des sporées récoltées dans les heures qui suivent la cueillette, et les mesures effectuées dans la phloxine-KOH 3 %. Plusieurs trouvailles intéressantes n'ont pas sporulé ; elles ne seront pas décrites ici : nous considérons en effet que la sporulation nous assure du bon état du spécimen recueilli, et que, vu la valeur des critères forme et taille de la spore dans le genre *Vararia*, seules des mesures de spores naturellement projetées sont valables. Lorsque les hyphes génératrices sont peu abondantes et de forme irrégulière, la recherche des boucles nécessite la dissociation poussée de fragments de carpophores : pour cela, après un bain éventuel dans HCl N pour dissoudre les cristaux d'oxalate, coupes et fragments sont plongés quelques heures à 60° C dans le Rouge Congo ammoniacal. L'observation se fait dans ce même mélange, si besoin est, en contraste de phase. Il est parfois nécessaire pour se débarrasser des contenus protoplasmiques de prolonger le traitement ammoniacal ou de remplacer l'ammoniaque par KOH à 3 ou 5 %. L'observation se fait encore dans le Congo ammoniacal. Ce colorant teinte en rouge les parois dextrinoïdes qui sont donc parallèlement congophiles ; on remarquera que les dichophyses jaunies ou brunâtres qui n'étaient plus dextrinoïdes ni congophiles à froid, retrouvent ces qualités après le traitement à 60° C par la potasse ou l'ammoniaque.

Nous avons pensé faire oeuvre utile en situant dans la clé du genre *Vararia*, à côté des espèces que nous

avons récoltées en Guadeloupe, les *V. ubatubensis* et *splendida* du Brésil, dont certaines récoltes guadeloupéennes sont affines, et les espèces signalées de la zone Caraïbe par Welden. Nous y ajouterons deux *Scytinostroma* tropicaux récoltés en Guadeloupe et qui au vu de leurs fibres dextrinoïdes à ramifications dichotomiques pourraient être recherchés dans le genre *Vararia*.

CLES

- A-Spores sphériques ou subsphériques, ornées, très amyloïdes ; conidiophores oedocéphaloïdes dans les cultures, notamment monocaryotiques ; boucles constantes..... genre DICHOSTEREUM
 A-Spores non amyloïdes ou avec une bavette supra-hilaire amyloïde, ou spores fusiformes à paroi mince tout amyloïde, lisse ou faiblement ornée ; pas de conidiophores oedocéphaloïdes en culture ; boucles présentes ou absentes genre VARARIA

Clé du genre *Dichostereum* :

- a-Gloeocystides nombreuses, larges de plus de 10 μm (9 à 23 μm) au contenu devenant solidifié ; spores à grosses verrues amyloïdes, et paroi gonflant dans les solutions alcalines. Jamaïque, Dominica, Guadeloupe *D. peniophoroïdes* (Burt)
 a-Gloeocystides ne dépassant pas 10 μm de largeur ; spores moins fortement ornées et à paroi ne gonflant pas dans KOH 3 %. U.S.A., Grenada.
 *D. pallescens* (Schw.)

Clé du genre *Vararia* : (1)

- a-Hyphes génératrices bouclées b
 b-Basidiomes minces à chair blanche ou pâle croissant généralement sur bois mort suspendu ; spores allongées (plus de deux fois plus longues que larges) c

1) portent un numéro d'ordre, les espèces qui seront décrites ci-après.

- c-Spores fusiformes larges, losangiques de face, 15-17x5-6,2 μm ; gloeocystides étroites, 20-33x4-5 μm , sulfo-aldéhydes positives avec schizopapille terminale. Guadeloupe.
 6- *V. rhombospora* n. sp.
- c-Spores plus étroites, x3,2-4,2 μm d
 d-Spores oblongues à subfusiformes, 9-15x3,5-4 μm
 dichophyses toutes à rameaux ultimes longs et souples. Brésil, Surinam.
 8- *V. splendida* (Viêgas)
- d-Spores longuement naviculaires de profil, biapiculées, à zone apiculaire oblique longuement rétrécie, 15-18-(21)x3,2-4,2 μm ; dichophyses profondes aux rameaux ultimes coniques droits, passant à des dichophyses aux rameaux extrêmes grêles et souples. Gabon, Guadeloupe 3- *V. intricata* B. & L.
- b-Basidiomes devenant épais (200 à 1000 μm), à chair rouille ou brune sauf en surface, croissant sur bois au sol ; petites spores ovoïdes ou oblongues courtes (rapport longueur sur largeur inférieur à 2).
 e
- e-Dichophyses hyméniales aux rameaux ultimes longs et souples ; gloeocystides sulfoaldéhydes positives ; spores ovoïdes oblongues 4-6,5x3-3,75 μm . Guadeloupe.
 1- *V. dussii* n. sp.
- e-Dichophyses superficielles à rameaux ultimes très courts f
- f-Dichophyses les plus profondes en couche lâche, de 30-50 μm d'envergure, à branches étalées, raides et ultimes rameaux coniques ; dichophyses moyennes formées d'un tronc sinueux à paroi épaisse qui porte des branches peu développées, en partie simples (non divisées et comme avortées) ; dichophyses superficielles plus étalées à rameaux ultimes assez nombreux grêles et courts ; spores ovoïdes, 3-4x2-2,5 μm .
 Brésil..... 9- *V. ubatubensis* (Viêgas)
- f-Dichophyses toutes à branches bien développées, écartées, avec rameaux ultimes cylindriques courts, obtus, assez larges ; spores subovoïdes, 3-4x2,5-3,25 μm .
 Guadeloupe 5- *V. minispora* n. sp.

- a-Hyphes génératrices sans boucles (cloisons simples) g
- g-Basidiome épais (1000 à 6000 μm); chair colorée, beige à brun fuligineux, s'assombrissant dans KOH h
- h-Spores sphériques lisses amyloïdes, 6-7,5 μm de diamètre; éléments dextrinoïdes de surface terminés par des rameaux longs, grêles, involutés. Sri Lanka, Aru island, Brésil, Guadeloupe.
..... voir *Scytinostroma albo-cinctum* (Berk. & Br.)
- h-Spores subcylindriques courtes, un peu déprimées, 8-10x4-5,25 μm , non amyloïdes; éléments dextrinoïdes de surface terminés par des rameaux cylindriques obtus.. Afrique intertropicale, Brésil, Guadeloupe.
..... voir *Scytinostroma phaeosarcum* B. & L.
- g-Basidiome mince, généralement moins de 100 μm , à chair blanche ou très pâle ne s'assombrissant pas dans KOH i
- i-Spores ovoïdes ou oblongues courtes, moins de deux fois plus longues que larges; gloecystides étroites avec schizopapille terminale j
- j-Dichophyses supérieures aux rameaux ultimes courts; spores ellipsoïdes très petites, 3-4x2-2,5 μm ; présence de rhizomorphes constitués en grande partie de fibres présentes aussi dans le subiculum. Jamaïque.
..... *V. fibra* Welden
- j-Dichophyses supérieures aux branches courtes et aux rameaux ultimes longs et grêles (type capillaire) k
- k-Spores oblongues larges, 9-11x7-8,5 μm , sans bavette; dichophyses supérieures de 15-25 μm d'envergure. Porto Rico, Guadeloupe, Arizona.
..... 7- *V. tropica* Welden

- k-Spores ovoïdes, $6,5-8 \times 4,75-5,5 \mu\text{m}$
 avec mince bavette amyloïde ;
 dichophyses de faible envergure
 ($8-13 \mu\text{m}$). Côte d'Ivoire, Gabon,
 Centrafrique, Guadeloupe.
 4- *V. minidichophysa* B. & L.
- i-Spores fusiformes plus ou moins bi-
 piculées 1
 1-Spores larges, $12,5-15 \times 4,8-6 \mu\text{m}$;
 dichophyses supérieures aux
 rameaux ultimes nombreux et
 courts (type coralloïde) ;
 gloeocystides et pleurogloeocystides
 trapues à paroi épaisse.. Argentine, Guadeloupe.
 2- *V. gomezii* B. & L.
- 1-Spores étroites ne dépassant
 pas $3,5 \mu\text{m}$ de largeur m
 m-Dichophyses de type capil-
 laire ; spores $16-17,5-(22)$
 $\times 2,5-3,25 \mu\text{m}$. U.S.A., Jamaï-
 que... *V. phyllophila* (Massee)
 m-Dichophyses superficielles à
 rameaux ultimes courts, obtus ;
 spores $10-13 \times 2,5-3 \mu\text{m}$. Trini-
 dad... *V. trinidadensis* Welden

Nous décrirons ci-dessous les *Vararia* nouveaux et nous nous contenterons de donner quelques précisions complémentaires sur les autres *Vararia* rencontrés en Guadeloupe, plusieurs espèces n'étant précédemment connues que par la seule récolte type. Seules les cultures obtenues pour la première fois seront décrites.

A - Le genre *DICHOSTEREUM* Pilát emend.

Il s'agit d'un ensemble regroupant au moins 8 espèces, que nous avons jusqu'ici traité comme sous-genre du genre *Vararia*. Particulièrement homogène et bien caractérisé, notamment par ses spores et ses conidiophores, cet ensemble mérite le rang de genre.

Pilát qui crée ce terme (1926) l'utilise dans un sens assez différent du nôtre pour des "Stereumartige Pilze welche ... stark gefärbte Dichophysen entwickeln...". Il

cite d'abord des espèces exotiques : *D. induratum* (Berk.), *D. albo-cinctum* (Bk. et Br.) et *D. duriusculum* (Bk. et Br.) qui sont pour nous des *Scytinostroma* (Boidin et Lanquetin 1976), et une seule espèce européenne qu'il décrit et pour laquelle il propose la combinaison : *D. durum* (Bourd. & Galz.) Pilát. Très logiquement Donk (1931, 1957) choisit cette dernière comme type ; Parmasto (1971, p. 83) ne croit pas faire autrement lorsqu'il indique comme type *V. pallescens* qu'il considère après Rogers et Jackson (1943) comme synonyme de *V. dura*. Seuls Clements et Shear (1931) ont suggéré de retenir *D. induratum*, première espèce citée. Tous les autres auteurs ont suivi Donk et son argumentation irréprochable. C'est pourquoi les règles nous font un devoir de reprendre ce nom de genre pour un ensemble d'espèces comprenant *Asterostromella dura* Bourd. & Galz., mais en en précisant le nouveau sens.

Caractères principaux du genre *Dichostereum* emend. :

Spores amyloïdes sphériques ou subsphériques, ornées de verrues et d'une bavette très amyloïdes, binucléées; gloeocystides sulfo-positives au moins dans la jeunesse ; dichophyses ; boucles constantes ; conidiophores oedocéphaloïdes produisant de petites conidies uninucléées sur mycéliums mono -comme sur mycéliums dicaryotiques ; comportement nucléaire subnormal ou hétérocytique ; tétrapolarité.

Espèce type : *Dichostereum durum* (Bourd. et Galz.) Pilát, 1926

Autres espèces : *Dichostereum brevisporum* (Rattan Resupinate Aphyllophorales of the North Western Himalaya, Cramer edit. 1977, ut *Vararia*) NOV. COMB. ; *Dichostereum effuscatum* (Cooke et Ellis, Grevillea, 9:103, 1881, ut *Corticium*) NOV. COMB. ; *Dichostereum granulatum* (Fr., Syst. Myc. 1:446, 1821, ut *Thelephora*) NOV. COMB. ; *Dichostereum pallascens* (Schw., Tr. Amer. Phil. soc., 4:167, 1832, ut *Thelephora*) NOV. COMB. ; *Dichostereum peniophoroides* (Burt, Ann. Missouri bot. Gard. 3:234, 1916, ut *Hypochnus*) NOV. COMB. ; *Dichostereum ramulosum* (Boid. et Lanq., Bull. Soc. Linn. Lyon, 42:165, 1973, ut *Vararia*) NOV. COMB. ; *Dichostereum rhodosporum* (Wakef., Kew Bull. Misc. Inf. 372, 1915, ut *Asterostromella*) NOV. COMB.

Dichostereum peniophoroides (Burt) Boid. et Lanq.
fig. 1

Etalé, adhérent, peu à peu épaissi avec marge brusque ou localement atténuée et plus pâle, isabelle terne (7,5 YR 7/4) (2). Surface mate, un peu bosselée, gris rosâtre (5 YR 5,8/2) ; aspect subfarineux sous la loupe, mais non pulvérulent.

En herbier la surface est beige (10 YR 6,8/3, vers vinaceous buff R.) comme le contexte. Elle apparaît sous la loupe comme semée de petites paillettes brillantes. Cohérent, il est cependant très tendre sous le rasoir.

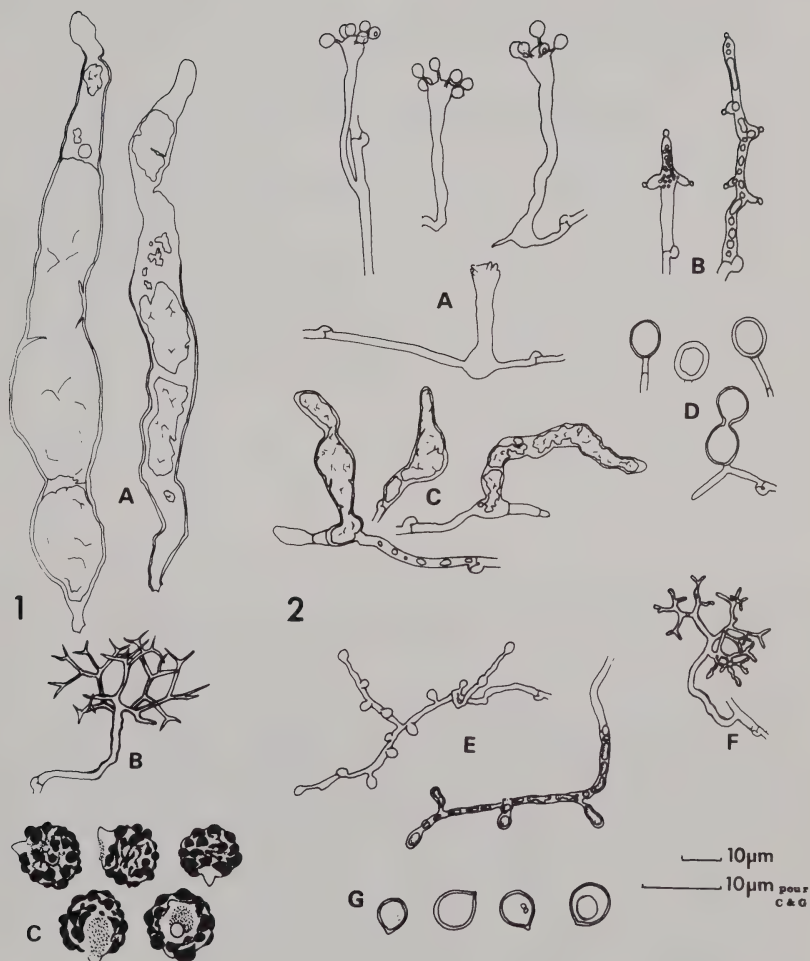
En coupe, épais de 250 à 700 μm . Il montre, à la base, une couche hyaline d'épaisseur variable (environ 100 μm) formée d'hyphes génératrices parallèles au support et qui englobent souvent des tissus de l'hôte ; ces hyphes x2-3 μm , bouclées, ont une paroi très mince et sont souvent vite flasques et peu distinctes. Cette couche est surmontée d'une zone de 100 μm de hauteur rappelant un contexte de *Scytinostroma*, elle est constituée de fibres enchevêtrées, bien dextrinoïdes, assez serrées, non raides, ramifiées dichotomiquement ; ces fibres, x1,2 μm environ, ont une paroi épaissie ; c'est parfois cette couche qui repose directement sur les cellules de l'hôte. On passe ensuite à une couche épaisse, formée surtout de gloeocystides verticales, serrées, auxquelles se mêlent des hyphes génératrices et des éléments dextrinoïdes, le tout densément constellé de spores enfouies. GLOEOCYSTIDES nombreuses, de forme irrégulière, subfusiformes à subcylindriques, 60-110-150x9-16-23 μm au contenu un moment densément guttulé, puis concrété en une ou plusieurs masses subhyalines réfringentes qui peuvent l'emplir toute et masquer la paroi qui les enveloppe ; cette paroi peut être mince ou sensiblement épaissie (0,8-1 μm , dans le Congo ammoniacal), cet épaississement étant le plus souvent situé dans la moitié inférieure, le sommet restant à paroi très mince et fragile. Nous n'avons

(2) Les références des couleurs sont celles de la Munsell Book Color Company (Baltimore, USA). Il s'y ajoute parfois des notations issues de Ridgway (R).

pu noter de réaction positive dans le sulfo-anisique ni voir de schizopapille sur ces grosses gloecystides. Hyphes du sous-hyménium à paroi mince, vite flasques, bouclées. DICHOPHYSES superficielles dextrinoïdes à branches étalées, ayant une envergure de 35-45 μm ; elles sont formées d'un stipe grêle, 18-40x2 μm à paroi submince à la base puis peu à peu épaissie; branches de premier et deuxième ordre larges de 1,5-1,8 μm à paroi sensiblement épaissie; les suivantes plus grêles et courtes, les ultimes rameaux peu raides, 2-4-5-10x0,8 μm , soit coniques soit, pour les plus longs, plus obtus avec paroi mince vers l'extrémité. BASIDES subcylindriques irrégulières, 40-55x7-8 μm à 4 stérigmates longs de 6 μm ; la paroi est mince et fragile. SPORES subsphériques, uniguttulées, de 6-8 μm de diamètre dans le Melzer sans les ornements, nettement teintées en masse (beige ombré, 10 YR 6/3 à 5/3), à paroi ornée de grosses verrues arrondies amyloïdes (elles peuvent atteindre 1,8 μm de diamètre) plus ou moins réunies par des trabécules étirés; une très nette bavette amyloïde encercle partiellement l'apicule. Après traitement ammoniacal à 60° C, la paroi est gonflée et mesure 0,8-1 μm sans les ornements. La spore est binucléée.

Récoltes examinées :

Un fragment d'holotype d'*Hypochnus peniophoroides* Burt, Moretown, Jamaica, F.S. Earle 540, oct.-nov. 1902, in herb. Bourdot (PC); LY 7660, vertical à 20 cm du sol sur une racine échasse en place d'un arbre abattu près du parc du Carbet, Basse Terre, le 6 août 1975; LY 7663, à proximité du précédent sur une autre souche semblable, mêmes lieu et date; LY 8112, sous un arbre tombé, près du sol, départ de la trace Victor Hughes au-dessus de Carrère, le 2 octobre 1976.



Dichostereum peniophoroides

Fig. 1 -Basidiome LY 7660 : A, grandes gloecystides au contenu solidifié ; B, dichophyse (A & B in Congo ammonia-cal 60° C) ; C, spores (in Melzer).

Fig. 2 -Cultures (LY 7660, 7663 et 8112) : A, conidiophores ; B, sulfocystides à plusieurs schizopapilles ; C, gloecysti-des au contenu solidifié ; D, chlamydospores ; E, hyphes por-teuses de renflements ; F, dichophyse ; G, conidiospores.

La description a été faite d'après les trois exemplaires guadeloupéens interfertiles.

Caractères cultureux de *D. peniophoroides* :

MONOSPERMES (8112) : les spores germent rapidement ; les hyphes sans boucles sont formées d'articles en très grande majorité à 1-2-3 noyaux, sauf le terminal qui en contient de 8 à 25. Conidiophores oedocéphaloïdes à tête renflée, $x(5)-7-(10) \mu\text{m}$, portant 4 à 8 pointes ; conidies subsphériques de $3,5-5,5 \mu\text{m}$ de diamètre ou piriformes, $4-5 \times 3-4,5 \mu\text{m}$, uninucléées. Des sulfocystides, des chlamydosporos et des dichophyses congophiles.

POLARITE : la confrontation de 10 monocaryons a permis de démontrer la tétrapolarité de l'espèce :

$$\begin{aligned} A_1 B_1 &: 1 - 2 \\ A_1 B_2 &: 4 - 6 - 8 \\ A_2 B_2 &: 3 - 7 - 9 \\ A_2 B_1 &: 5 - 10 \end{aligned}$$

MONOCONIDIENS : la germination de conidies prélevées sur les cultures dicaryotiques de 7660 et 7663 donne naissance à des cultures monocaryotiques intercompatibles (3) avec les monospermes de 8112. Par acquis de conscience ont été effectuées des confrontations avec les 4 pôles des *D. rhodosporem*, *pallesens* (parfois considérés comme synonymes de *peniophoroides*) et *ramulosum*. Tous les résultats sont négatifs (Tableau I). Ces données complètent les essais d'interfertilité dans le genre *Dichostereum* effectués par P. Lanquetin (1973, tableau I, p. 171).

(3) Nous employons habituellement les termes de "interfertile" et "interfertilité".

Le mot "fertilité" peut laisser croire que ces appariements donnent naissance à une descendance, chose possible, mais qui n'est généralement pas obtenue ni même recherchée. Nous emploierons ci-après les termes d'"intercompatible" et d'"intercompatibilité" quand les monocaryons de deux récoltes distinctes appariés se dicaryotisent l'un l'autre.

Dichostereum peniophoroides

		LY 8112				7660				7663	
		A ₁ B ₁	A ₁ B ₂	A ₂ B ₂	A ₂ B ₁	1	2	3	4	1	2
LY 8112	A ₁ B ₁	-	-	+	-	+	+	+	+	+	+
	A ₁ B ₂		-	-	+	+	+	+	+	+	+
	A ₂ B ₂			-	-	+	+	+	+	+	+
	A ₂ B ₁				-	+	+	+	+	+	+
T 433	A ₁ B ₁	-	-	-	-	-	-	-	-	-	-
	A ₁ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₁	-	-	-	-	-	-	-	-	-	-
FP 90120	A ₁ B ₁	-	-	-	-	-	-	-	-	-	-
	A ₁ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₁	-	-	-	-	-	-	-	-	-	-
LY 6242	A ₁ B ₁	-	-	-	-	-	-	-	-	-	-
	A ₁ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₂	-	-	-	-	-	-	-	-	-	-
	A ₂ B ₁	-	-	-	-	-	-	-	-	-	-

Tableau I : confrontations de monocaryons de pôles connus, et de mono-conidiens (en chiffres arabes). LY 8112, 7660 et 7663 sont les trois récoltes guadeloupéennes de *D. peniophoroides* ; T 433 est un *D. rhodosporum* isolé par Warcup en Australie ; FP 90120 est un *D. pallescens* du Maryland (USA) déterminé par R.L. Gilbertson ; LY 6242 est *D. ramulosum* type, originaire du Gabon.

POLYSPERME : (7660 - 7663 - 8112)

Croissance : rapide (boîtes couvertes en trois semaines).

Aspect : la marge est régulière, peignée ; le mycélium aérien jeune est blanc pur, élevé, un peu peigné. A six semaines, sublaineux - pelucheux dans la partie jeune, il devient tassé, feutré avec surface ruguleuse dans la moitié âgée. D'abord blanc pur, il se tache par plages de saumon jaunâtre (7,5 YR 8/6) tendant à saumon (5 YR 7/6) et même à fauve (5 YR 6/8) sur le bourrelet qu'il forme à la périphérie contre le verre. Le revers est inchangé, l'odeur est nulle.

Microscopie : (fig. 2)

mycélium aérien : les hyphes axiales régulières, $x3,5-4-6 \mu m$, et les rameaux, $x(1)-2,5-3 \mu m$, ont un contenu homogène, une paroi mince et des boucles constantes. On observe en outre :

1) à côté de nombreuses sulfo-cystides formées par un article terminal étroit, $x1,5-2-3 \mu m$, portant de 2 à 5 et même 7 protubérances surmontées d'une schizopapille, d'autres éléments plus renflés, $27-35 \times 6-10 \mu m$, dont le contenu paraît solidifié et ne réagit pas dans le sulfonitrique tout comme les gloeocystides au contenu concrété du basidiome (fig. 2 C).

2) d'abondantes chlamydospores subsphériques, $x8-12 \mu m$ à paroi pouvant atteindre $2 \mu m$ d'épaisseur.

3) de nombreuses dichophyses géométriques de grande envergure ($40-50 \mu m$), souples, à branches étroites, $x1-1,5 \mu m$, congophiles et à rameaux ultimes grêles, $x1-1,5 \mu m$.

4) quelques conidiophores élancés, à paroi d'abord mince mais pouvant paraître nettement épaissie dans les cultures âgées, à tête élargie, $x(5)-6-8 \mu m$, produisant (4)-6-8-(10) conidies subsphériques, $x3,5-5 \mu m$, à légèrement piriformes, $(3,75)-4-5-(6) \times 3,5-4-(5,5) \mu m$, à paroi épaissie et apicule très peu marqué. Les conidiophores sont beaucoup plus nombreux dans le mycélium aérien jeune.

mycélium submergé : sur les hyphes régulières, en majorité larges de $1-2,5 \mu m$, sauf quelques axes de $3-4,5 \mu m$, à paroi mince, bouclées, on observe un grand nombre de rameaux au contenu réfringent morcelé et porteurs de nombreux renflements courts (fig. 2 E).

Cytologie : articles et chlamydospores binucléées ;
conidies uninucléées.

Oxydases :

ac.gallique : +++,tr. gaïacol : +++,tr.
p.-crésol : - ou très faible tyrosine : - ou ++,10mm

CODE : 2a-(2b)-3c-15-25 d -33-34-36-38-43-54-60-63

Remarques : A l'oeil nu son mycélium blanc pur teinté de saumon se distingue de celui de *D. ramulosum* taché de cannelle et de celui de *D. pallescens* entièrement cannelle. Plus proche de *D. rhodosporum* par sa couleur, il se reconnaît à sa croissance nettement plus rapide. Microscopiquement, il est surtout reconnaissable à ses gloeocystides renflées au contenu solidifié sulfo-négatif et aux articles submergés porteurs de nombreuses protubérances arrondies, caractères qui n'apparaissent pas dans le code.

La tétrapolarité démontrée pour *D. peniophoroides*, est un caractère de tous les *Dichostereum* ; si Maxwell (1954) a signalé *Vararia granulosa* bipolaire, c'est pour avoir disposé d'un trop faible nombre de cultures monocaryotiques. Grâce à R. Siepmann qui obtint la fructification d'un dicaryon dû à R.L. Gilbertson (n° 4426, sur *Abies lasiocarpa*, Montana 1964) nous avons pu reprendre cette étude : la confrontation de 20 monospermes a donné le résultat suivant :

A_1B_1 : 1-3-5-9-13-16-20
 A_2B_2 : 2-6-14-17
 A_2B_1 : 4-12-15-19
 A_1B_2 : 7-8-10-11-18

La souche de Maxwell est intercompatible avec celle de Gilbertson.

De même, le *Dichostereum ramulosum* africain, dont la culture type (LY 6242) a fructifié chez R. Siepmann, s'est révélé tétrapolaire :

A_1B_1 : 1-2-3-8-13-14
 A_1B_2 : 4-5-7-16-19
 A_2B_2 : 11-12-17-20-21-22
 A_2B_1 : 6-9-10-15-18

B - Le genre *VARARIA* Karst.

Tous les représentants appartiennent à la section *Vararia*.

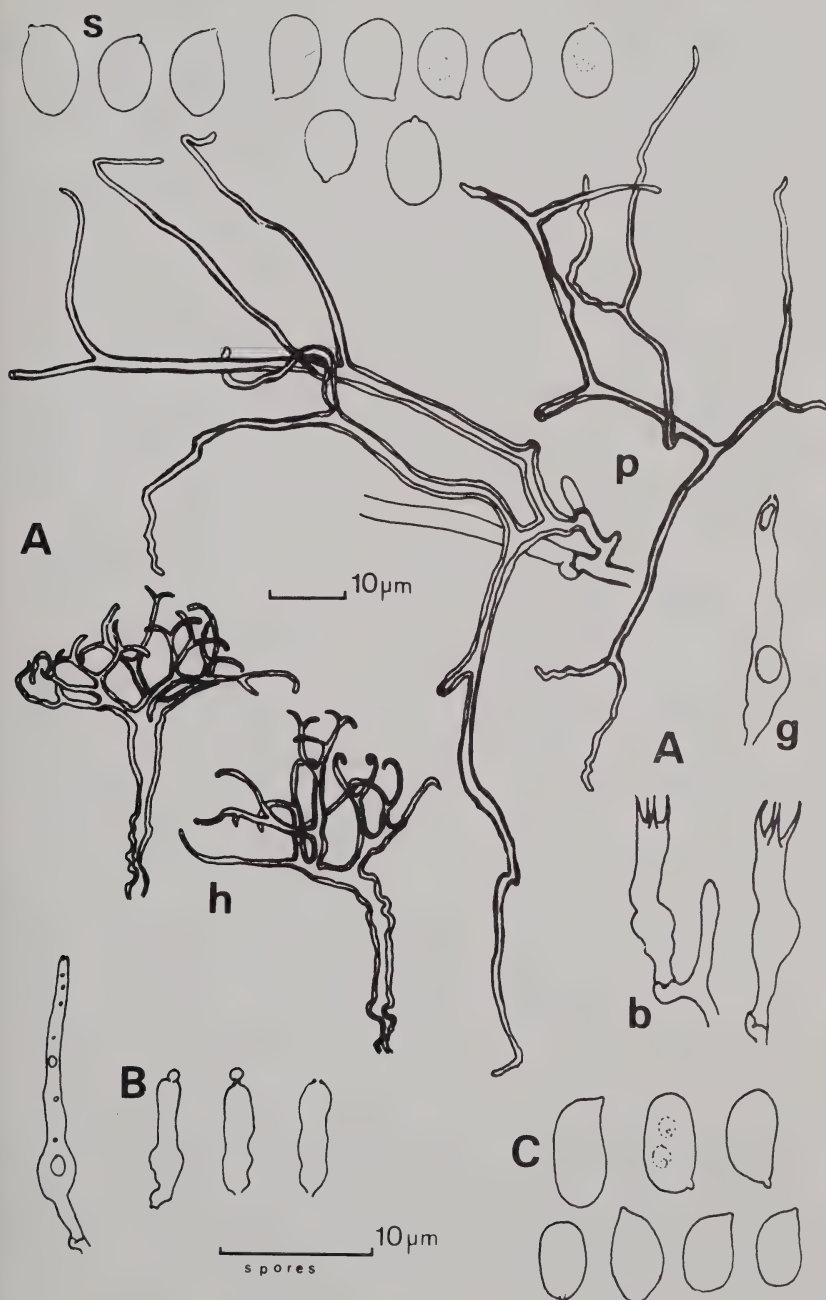
I - *Vararia dussii* nov. sp. ★ fig. 3

Expansa, haerens, duriuscula, mox crassa, cinnamomea vel brunnea, carne brunneola. Hyphis genetricibus fibulatis. Dichophysibus immersis, e brunneis luteis; dichophysibus superis dextrinoideis trunco pariete saepe incrassata, et ramis ultimis longis lentisque. Gloeocystidiis raris, saepe schizopapilla globosa superatis, per S.A. parum coloratis. Basidiis utriformibus, tetrasporis. Sporis ovoidis 4 - 6 x 3,25-3,75 μ m, in massa albis, haud amyloideis, uninucleatis. Nuclei rite dividuntur; culturae mono- vel polyspermatice oïdia edunt. Tetrapolaris. Humi in ligno. Guadeloupe. HOLOTYPE LY 8115.

Petites taches très adhérentes, brunes en bonne sporulation (7,5 YR 5 à 5,5/4), cannelle (7,5 YR 6/6 à 5,5/6) à testacé pâle (de 5 YR 5,5/6 à 6,5/6) à la récolte, parfois ocre (8,5 YR 7,5/6), mates, coriaces, avec marge similaire amincie très adhérente concolore ou parfois plus

★ en hommage au Père A. DUSS, pionnier de la mycologie aux Antilles françaises.

fig. 3 : *Vararia dussii*. Basidiome A) LY 8115 (TYPE) : dichophyses profondes (p), deux dichophyses hyméniales superficielles (h), basides (b), une gloeocystide à schizopapille cassée (g) et spores (s) ; B, LY 7638 : gloeocystides à schizopapille en place ou cassée ; C, LY 8020 : spores. In Congo ammoniacal 60° C, sauf spores in KOH-Phloxine.



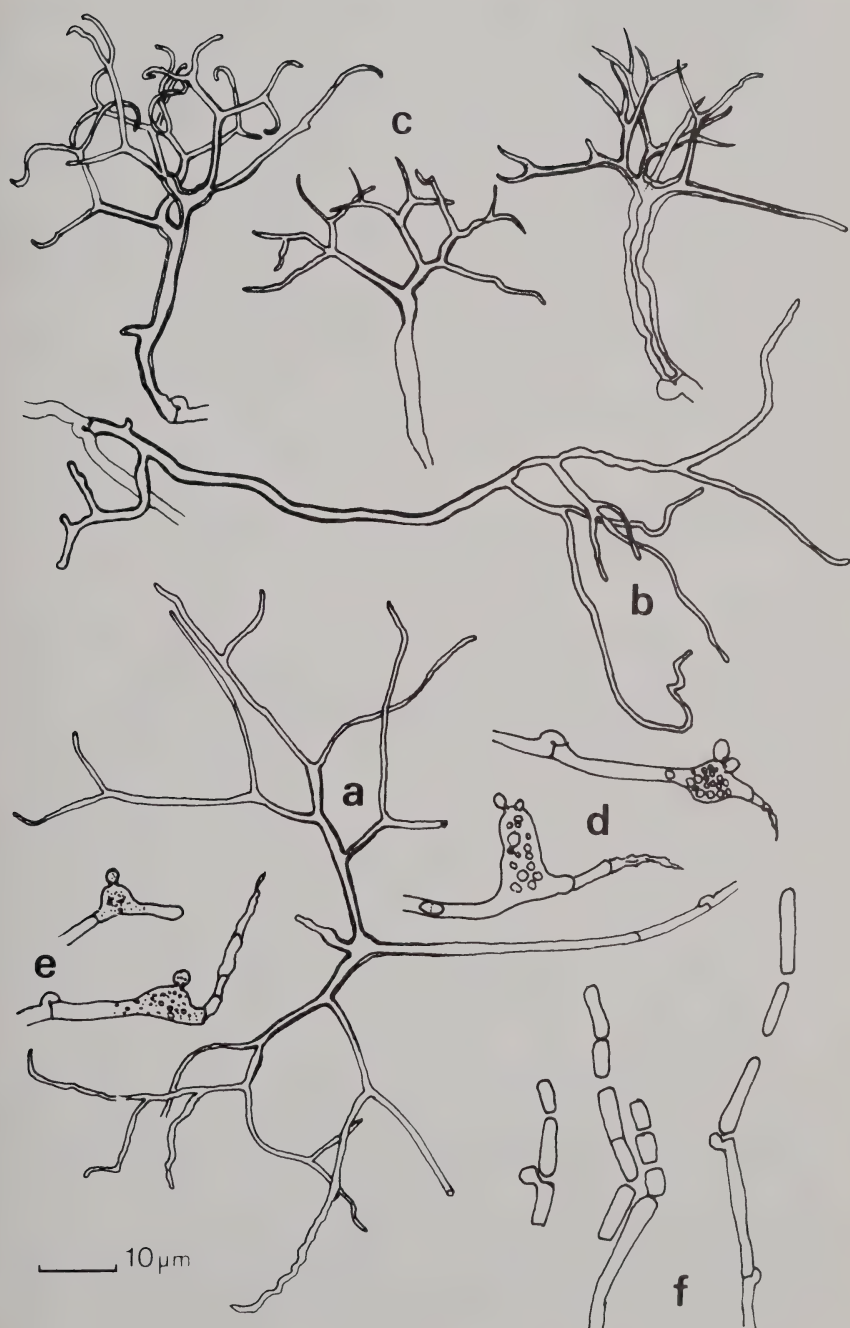
pâle (p.ex. 10 YR 7/4 à 8/6) ; d'abord mince, il est rapidement plus épais (jusqu'à $500\text{ }\mu\text{m}$), même sur des taches de faible diamètre qui ont alors un bord brusque ; sa chair est alutacée, puis brunit ; il peut confluer en d'assez larges plaques.

En herbier, très adhérent et très mat, alutacé pâle (9 YR 8/6) à isabelle (7,5 YR 7/6, 8 YR 7/4), brun souris (9 YR 6/4) sur les spécimens plus épais, avec marge parfois un peu plus sombre. La chair est brune.

Dans les cellules de l'hôte, ou lorsque la base du champignon est mêlée à des débris du support, on peut voir des dichophyses, isolées ou en amas, de grande envergure (dépassant 100 ou même $120\text{ }\mu\text{m}$), à paroi dextrinoïde, aux ramifications espacées, aux branches longues et souples rappelant en plus grêle les hyphes dextrinoïdes des *Scytinostroma* ; elles ont des ultimes rameaux mesurant $30\text{-}40 \times 0,75\text{ }\mu\text{m}$.

En coupe épais de 80 à $500\text{ }\mu\text{m}$. Dès la base, il est constitué de dichophyses enchevêtrées avec fréquents amas de cristaux hyalins ; les dichophyses immersees ne sont, le plus souvent, que peu ou pas dextrinoïdes contrairement aux dichophyses de surface, mais toutes sont bien congophiles à chaud. DICHOPHYSES profondes jaune-brunâtre de $20\text{-}45\text{ }\mu\text{m}$ d'envergure, ayant un tronc $17\text{-}25 \times 2\text{-}3\text{-}(4)\text{ }\mu\text{m}$ à paroi épaisse à très épaisse, des premières branches écartées et des rameaux ultimes grêles, peu ou pas incurvés. Les dichophyses superficielles arborescentes aux rameaux ultimes grêles et souples présentent un stipe subcylindrique assez long ($20\text{-}35\text{ }\mu\text{m}$) parfois élargi, $2\text{-}5\text{ }\mu\text{m}$, à paroi mince ou épaissie dans la moitié supérieure (peut atteindre $1\text{ }\mu\text{m}$), ou sur une plus grande longueur, formant alors un tronc noueux, difforme ; le stipe ou le tronc porte une ramure groupée au sommet, de $10\text{-}20\text{-}35\text{ }\mu\text{m}$ d'envergure, terminée par des rameaux grêles, souvent longs et souples,

fig. 4 : *Vararia dussii* : Cultures. LY 8020 : dichophyse à la marge d'une culture sur Hagem (a), dichophyse en milieu de Nobles submergée (b), trois dichophyses de la couche brune superficielle sur Nobles à 6 semaines (c), gloeocystides sur Nobles (d) ; LY 7638 : gloeocystides sur Hagem (e), oïdies sur Hagem (f).



involutés, pouvant atteindre 15 et parfois 25 x 0,6 μm ; elles ne diffèrent des dichophyses profondes que par leurs branches moins écartées et leurs ultimes rameaux plus longs et involutés. HYPHES génératrices x 1,5-3,2 μm à paroi mince, bouclées. Assez rares GLOEOCYSTIDES soit subcylindriques, 15-17 x 3-3,5 μm , parfois élargies vers le bas (x 4,5 μm), soit fusiformes longuement atténuées, 38 x 5,5-6 μm par exemple ; elles ne sont pas beaucoup plus évidentes dans les sulfo-aldéhydes, bien qu'elles réagissent quelque peu ; elles sont généralement terminées par une schizopapille sphérique de 1,5 μm de diamètre. BASIDES utriformes, 20-25 x 3,5-4,2 μm au sommet, renflées jusqu'à 5,5 μm dans la partie inférieure, étranglées (x 2,5 μm) à mi-hauteur, à 4 stérigmates longs de 4 μm . SPORES ovoïdes ou un peu oblongues, 4-6x(3)-3,25-3,75-(4) μm chez le type, blanches en masse, à petit apicule, à paroi non amyloïde et sans bavette, uninucléées. Si les spores ont des dimensions analogues dans 3 autres récoltes, celles du 8020 sont plus élancées, 5,25-7,25x3-3,75 μm , et 10,9 % d'entre elles sont binucléées (se reporter à la discussion).

Récoltes :

LY 7638, sur petite branchette au sol, départ de la trace Victor Hugues, au dessus de Carrère, 2 août 1975 ; LY 8020, branche au sol, domaine Duclos, Petit Bourg, 24 sept. 1976 ; LY 8115, HOLOTYPE, sur branche morte de *Sloanea* sp., Bras David, Parc Naturel, 4 octobre 1976 ; LY 8167, à l'intérieur d'une racine rampante creusée de galeries de termites, chemin forestier de Jules, Petit Bourg, 8 octobre 1976 ; LY 8184, sur *Philodendron giganteum* mort en place, Domaine Duclos, Petit Bourg, 10 octobre 1976.

Parmi les espèces bouclées à petite spore, il est notamment reconnaissable à ses dichophyses aux rameaux ultimes longs et souples.

Caractères cultureux de *V. dussii* :

GERMINATIONS.- La spore émet en 48 heures un filament de quelques articles uninucléés.

MONOSPERMES.- (LY 8020, 8115, 8167, 8184) Les jeunes germinations peuvent être prélevées au bout de 24 heures ; elles donnent des cultures sans boucles, aux articles ré-

gulièrement uninucléées ; elles forment de petites oïdies (arthrospores) uninucléées.

MONOIDIENS.- La dispersion d'oïdies nées sur le mycélium dicaryotique (LY 7638) a permis d'obtenir des cultures monocaryotiques semblables aux haplontes des autres récoltes.

POLARITE.- Les monocaryons de l'holotype (LY 8115) se répartissent en 4 groupes

A_1B_1 : 1-9-10

A_1B_2 : 3

A_2B_2 : 2-4-8

A_2B_1 : 5-6-7

Des fausses boucles apparaissent dans la majorité des confrontations de monocaryons ayant le facteur B commun.

INTERCOMPATIBILITES (3).- Les 32 appariements de monospermes 8115 avec ceux des 8020, 8167 et 8184 et avec les mono-oïdiens de 7638 sont totalement positifs. Ils permettent de savoir que les différences observées (spores, couleur des mycéliums) sont du domaine de la variation intraspécifique.

POLYSPERME.- (7638-8020-8115-8167) fig. 4

Croissance : rapide (boîtes couvertes en 3 semaines).

Aspect : la marge est régulière, le mycélium aérien très pauvre et bas, est surmonté de plages pelucheuses irrégulièrement développées. Initialement blanc, le mycélium prend avec l'âge une coloration dont l'intensité et l'étendue varie beaucoup avec les souches. Chez 7638, seul le mycélium contre le verre se teinte très légèrement ; chez 8167, la bouture et ses abords sont saumon jaunâtre (7,5 YR 8/6) à cannelle (6/6) ; chez 8115, les zones pelucheuses sont saumon jaunâtre (7,5 YR 8/6) tandis que la bouture et la périphérie sont fauve (5 YR 6/8 à 5/8) et parfois noisette (5/6) ; enfin chez 8020, à six semaines, la coloration est partout cannelle (7,5 YR 6/6). Le revers incolore chez 7638 est nettement et irrégulièrement bruni chez les autres sous le mycélium teinté. Odeur nulle.

Microscopie :

Mycélium aérien : il présente 1) des hyphes génératrices étroites, x1,5-3-(4) μm , régulières, à paroi mince et boucles constantes, et quelques hyphes plus larges, x 4 - 6 μm ,

2) d'innombrables gloeocystides petites, renflées, x 3 - 5 - (6) μm , de forme variable, et portant 1 à 3, le plus souvent 2 schizopapilles (fig. 4 d) ; leur contenu, densément guttulé, est nettement violet-noir dans le sulfo-anisique.

3) de petites oïdies rectangulaires, très abondantes dans les cultures jeunes.

4) des bulbilles, rares dans 7638 et 8020, fréquentes dans 8115 et 8167 ; ce sont des vésicules subsphériques, x(8)-9-12-(15) μm portant 8 à 10 rameaux très courts.

5) des dichophyses de plusieurs types, surtout nombreuses dans les zones colorées. Celles de surface sont géométriques, de 20-40-(60) μm d'envergure, avec un stipe large de 2-3 μm , assez court, naissant d'une boucle ; leurs rameaux terminaux assez grêles sont souples ; elles sont brunâtres dans l'eau. Celles qui, sous-jacentes, se mêlent aux hyphes génératrices ont un très long stipe à paroi régulièrement épaissie comme une fibre et des ramifications cylindriques obtuses. 7638, qui se colore peu, n'a pas montré les dichophyses de surface.

Mycélium submergé : les hyphes généralement étroites, x 2-4 μm , peu régulières ont un contenu guttulé, tandis que des hyphes axiales, x 5-7 μm régulières ont un contenu homogène, une paroi souvent mince mais qui peut s'épaissir localement (0,5 à 1 μm) ; les boucles sont constantes.

Cytologie : articles binucléés ; les oïdies sont soit à un soit à deux noyaux.

Oxydases :

ac.gallique : +++++, 0

p.-crésol : TF (8115 et 8167)

- (8020 et 7638)

gaïacol : +++++, 20 mm

tyrosine : +, 10 mm

CODE : 2a-(2b)-3c-15-22-25 d-35-36 et 38 ou 37 et 39-43-54-60-61.

2 - *Vararia gomezii* Boid. et Lanq., Bull. soc. Mycol. France, 91 : 493, 1975 (1976).

Cette espèce décrite récemment d'Argentine sur une seule récolte a été retrouvée en Guadeloupe.

Elle se présente en petites taches à marge nette à l'oeil, atténuée poruleuse sous la loupe, confluentes en une membrane adhérente ou seulement détachable par petits fragments, alutacé pâle (10 YR 8/3,5). En herbier, elle est fragile sous l'aiguille mais non pulvérulente, un peu fendillée, alutacé pâle (10 YR 8,5/3,5 à 4).

Sa microscopie est tout à fait semblable à celle du type (voir fig. 5), avec hyphes sans boucles, GLOEOCYSTIDES ou pleurogloeocystides à paroi épaissie à épaisse, les unes courtes, d'autres plus allongées, 14-50 x 8-14 μm , au contenu sulfo-anisique négatif. Les DICHOPHYSES inférieures non dextrinoïdes sont en couche lâche ; leurs branches sont raides mais à paroi peu épaissie, et les rameaux ultimes sont longs. En s'élevant dans le basidiome, on passe très vite à des dichophyses aux rameaux ultimes nombreux, courts (type coralloïde) et obtus ; les supérieures sont très dextrinoïdes. BASIDES utriformes à paroi mince, 34-45 x 7,5 μm au sommet, tétrasporiques. SPORES largement fusiformes, biapiculées, 13-14,8 x 4,8-6,25 μm ($\bar{x}$ = 13,73 $\pm$ 0,69 x 5,64 $\pm$ 0,62 pour N = 17).

Récolte :

LY 8062, sur branchette, chemin forestier de Jules, Petit-Bourg, le 27 septembre 1976.

Parmi les espèces sans boucles, *V. gomezii* est bien caractérisé par ses spores larges, ses dichophyses coralloïdes et ses gloeocystides à paroi épaisse. Il existe en Guadeloupe au moins un autre *Vararia* à dichophyses coralloïdes ; il ne sera pas décrit ici, le matériel étant trop pauvre et n'ayant pas sporulé ; signalons cependant qu'il diffère de *V. gomezii* par ses boucles, ses spores plus grêles ... (à rechercher).



Fig. 5 - *Vararia gomezii* LY 8062 : A, baside à paroi mince et gloecystides à paroi gonflée (in Congo ammoniacal 60° C) ; B, une dichophyse semi-profonde (p) non dextrinoïde et une dichophyse superficielle (s) dextrinoïde ; C, dichophyse superficielle deux fois plus grossie (B et C, in Melzer) ; D, spores (KOH-phloxine).

Caractères cultureux de *V. gomezii* :

MONOSPERMES.- Ils peuvent être isolés 24 heures après l'ensemencement ; leurs hyphes, sans boucles, sont constituées d'articles en majorité binucléés, de quelques articles isolés de 1, 3, 4, ou même 5 noyaux, et de quelques séries d'articles trinucélés. Les six cultures colorées ont montré cette même répartition nucléaire, semblable d'ailleurs à celle du polysperme ; l'espèce est donc vraisemblablement homothalle.

POLYSPERME.-

Croissance : rapide (boîte couverte en 3 semaines).

Aspect : la marge très régulière est appliquée. Lâche, duveteux, élevé quand il est jeune, le mycélium aérien blanc à 6 semaines, est appliqué sur toute la surface de la boîte ; toutefois dans les deux tiers jeunes il est recouvert par un aranéum régulier, réticulé, à points d'intersection en relief. Dans le tiers âgé, le mycélium appliqué montre des amas et des petites veinules blanc pur. Ce n'est que localement et contre le verre que le mycélium se teinte d'alutacé (10 YR 8/4) à chamois pâle (7/6).

Microscopie :

Mycélium aérien : hyphes sans boucles, en majorité régulières, étroites, x 1,5-2-3 μm , à paroi mince parfois collapse, et des hyphes plus larges, x 4-(6) μm , irrégulières, à paroi mince ou épaissie (jusque 1 μm) portant de très nombreux éléments renflés, x 7-15 μm , qui emprisonnent des masses réfringentes ; leur paroi est très épaisse (1 à 3 μm).

Le mycélium aérien teinté est porteur de masses huileuses. Sur milieu de Hagem, on peut observer de très rares mais belles dichophyses géométriques aux rameaux ultimes courts ; leur envergure est de 20-35 μm .

Mycélium submergé : hyphes très irrégulières, certaines étroites, x 1-3 μm , à paroi mince, d'autres plus larges, x 3,5-4-(6) μm , à paroi très épaisse avec renflements nombreux. Dans la partie âgée, ces hyphes forment une couche très coriace de un millimètre d'épaisseur (fig. 6).

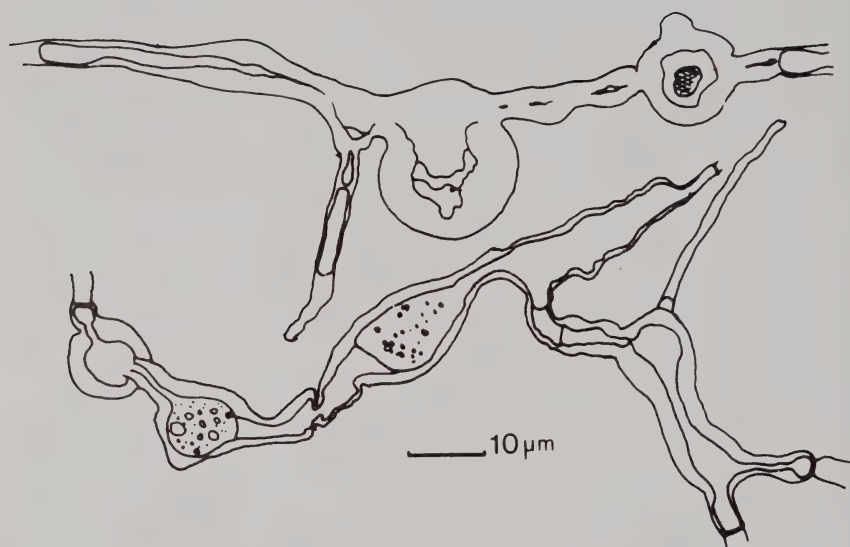


Fig. 6 - *Vararia gomezii*, Culture LY 8062 : hyphes à paroi très épaissie, caractéristiques de cette espèce.

Boucles : absentes.

Cytologie : articles binucléés ; on observe quelques suites d'articles trinucléés et quelques rares articles isolés à 4 ou 5 noyaux.

Oxydases :

ac.gallique : +++++, 0	gaïacol : +++, 0
p.-crésol : M	tyrosine : +, tr.

CODE : 2-6-(25 d)-32-36-38-43-54-57-(62).

3 - *Vararia intricata* Boid. et Lanq., Bull. Soc. Mycol. France, 91 : 473, pl. III fig. B, 1975 (1976)

Nous avons plusieurs récoltes de cette espèce connue seulement à ce jour du Gabon par la récolte type. Cinq d'entre elles ont permis d'isoler des cultures monospermes qui se sont montrées intercompatibles, ce qui nous permet de beaucoup mieux connaître les variations microscopiques de cette espèce, notamment au niveau des gloeocystides (voir fig. 7 et 8).

Basidiome à marge mince, prulineuse, puis discontinu-poruleux sous la loupe, enfin en membranule détachable par petits lambeaux avec l'aiguille quand il est très frais, mais devenant vite très adhérent en séchant. Surface mate gris crème (2,5 Y 8/2) puis crème alutacé (2,5 Y 8/4) ou un peu plus sombre (7,5/4), passant ensuite à chamois clair (8/5, puis 8/6 et même 7,5/6).

Très mince, 30 à 65 μm , il est formé dès la base de dichophyses mêlées à quelques hyphes génératrices à paroi très mince, x 1,8-3,8 μm , bouclées, mais peu distinctes. Les DICHOPHYSES inférieures non dextrinoïdes apparaissent jaunâtres à jaune brunâtre dans KOH ; elles ont une envergure de 25-40 et même 70 μm avec stipe hyphiforme atteignant 40 x 3,5 μm à paroi toujours mince sauf au sommet ; les branches de premier et deuxième ordre, très écartées, ont une paroi rigide, épaissie à très épaisse mais gardant un large lumen et sont de longueur variable, 3-8 x 1,8-2,5 μm pour les premières ; les rameaux ultimes sont coniques soit courts et raides, soit parfois plus longs, grêles et souples. De très rares dichophyses ont des rameaux ultimes courts et obtus (en croissance ?). En surface, les dichophyses dextrinoïdes sont plus ou moins nombreuses parfois éparses ; sur un stipe toujours indifférencié et non dextrinoïde sauf au sommet, elles portent des branches à paroi épaissie mais souvent courtes tandis que les ultimes rameaux s'allongent, 3-9-(17) μm et se recourbent ; leur envergure est de 20-40 μm .

Si, de la base au sommet du basidiome les dichophyses dominantes ont des rameaux ultimes courts puis de plus en plus allongés et grêles, on peut cependant voir dès la base quelques dichophyses à rameaux ultimes longs

et, en surface, quelques dichophyses aux rameaux ultimes relativement courts.

GLOEOCYSTIDES variables : elles sont souvent peu remarquables, subcylindriques et plus fréquemment élargies vers le bas et longuement rétrécies, exceptionnellement claviformes, $24-60 \times 6-10-(15) \mu\text{m}$, à paroi très mince ; il est parfois possible d'observer une schizopapille au sommet de certaines gloeocystides faiblement émergentes ; leur contenu peu remarquable se limite souvent à quelques amas réfringents. Dans les spécimens plus âgés on ne voit par contre que des gloeocystides immergées, trapues, à paroi épaissie, $25-40 \times 8-12-14 \mu\text{m}$, pouvant laisser voir un sommet vide et affaissé, flétri ; elles contiennent une grosse masse résinoïde insensible à l'iode. Toutes se sont montrées sulfo-aldéhydes négatives.

Basidioles d'abord ovoïdes, larges de $8-9 \mu\text{m}$, puis étirées en col, irrégulièrement subcylindriques un peu étranglées au milieu, à paroi très mince et contenu finement guttulé ; BASIDES, $25-35 \times 5,5-6,5 \mu\text{m}$ au sommet, à 4 stérigmates atteignant $6,5 \mu\text{m}$ de longueur.

SPORES allongées, étroites, longuement naviculaires de profil, biapiculées, à zone apiculaire longuement et obliquement rétrécie, $(14,5)-15,5-17-(21) \times 3,2-4,2 \mu\text{m}$, non amyloïdes ($\bar{x} = 16,8 \pm 1,4 \times 3,85 \pm 0,34$, pour $N = 77$). Elles sont blanches en masse et uninucléées.

Récoltes :

LY 8036, sur branchette morte en l'air, Domaine Duclos, Petit Bourg, le 25 septembre 1976 ; LY 8098, sur branchette morte suspendue, forêt mésophile de la Lézarde, Petit-Bourg, le 30 septembre 1976 ; LY 8123, sur branchettes et feuilles mortes ne touchant pas le sol, Bras David, le 4 octobre 1976 ; LY 8166, au pied d'un arbuste mort, chemin forestier de Jules, le 8 octobre 1976 ; LY 8173-8174 et 8175, sur branchettes en l'air, Domaine Duclos, Petit-Bourg, le 8 octobre 1976.

Dans les gros vaisseaux du bois support, on voit, chez LY 8175, mêlées aux hyphes génératrices bouclées, des hyphes à paroi épaissie mais lumen large, plus ou moins dextrinoïdes, $\times 1,2-2,5 \mu\text{m}$, ramifiées de temps à autre, souvent flasques, rappelant en plus grêles des fibres de *Scytinostroma*.

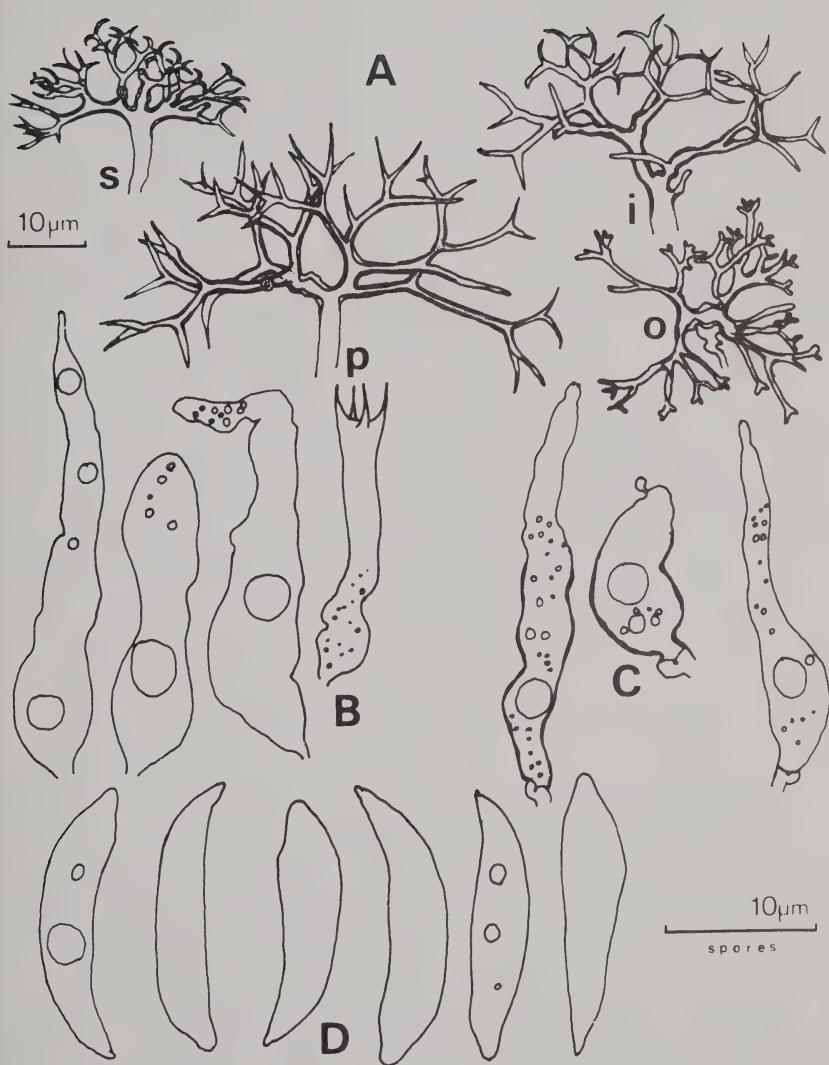


Fig. 7 - *Vararia intricata* A, LY 8175 : dichophyses superficielle (s), intermediaire (i), et profonde (p) et une à extrémités obtuses, vue par dessus (o). B, LY 8166 et C, LY 8174 : gloeocystides (A, B, C in Congo 60° C). D, spores de LY 8174 (in KOH-phloxine).

Nos récoltes guadeloupéennes rappellent bien le *Vararia intricata* gabonnais ; nous aurions cependant souhaité, pour affirmer sans réserve cette identification, confronter des cultures monocaryotiques africaines et américaines. Malheureusement nous n'avons pu, en 1968, à l'arrivée de la sporée de l'holotype à Lyon, obtenir la germination des spores et à ce jour nous ne disposons pas de monocaryons africains.

Ce champignon n'est pas sans ressemblances avec *V. splendida* (Viêgas) qui diffère par ses spores bien plus courtes, ses gloecystides et ses dichophyses toutes à rameaux ultimes longs et souples.

Nous avons récolté sur tronc au sol, et non sur branches en l'air, un *Vararia* apparenté à *V. intricata*. Il est sans boucles, à spores un peu plus étroites, 15-19 x 3-3,5-(3,8) μm , non biapiculées ; il est très riche en gloecystides à tous niveaux, irrégulièrement subcylindriques à paroi un peu épaissie dans la moitié inférieure ; les dichophyses profondes ne sont pas géométriques raides à rameaux ultimes coniques, mais toutes à rameaux ultimes longs et grêles. A rechercher.

Caractères cultureux de *V. intricata* :

GERMINATIONS.- (LY 8098) au bout de 3 jours, la spore émet un filament aux articles uninucléés.

MONOSPERMES.- Hyphes irrégulières dépourvues de boucles, constituées de longs articles uninucléés. Fibres congophiles.

POLARITE.- L'espèce est tétrapolaire. Des fausses boucles et des crochets apparaissent dans la majorité des confrontations de monocaryons à facteur B commun chez 8098, tandis que ceux-ci sont rares (vus seulement dans 1 x 4, 1 x 15, 1 x 16 et 1 x 17, en petit nombre) chez 8166.

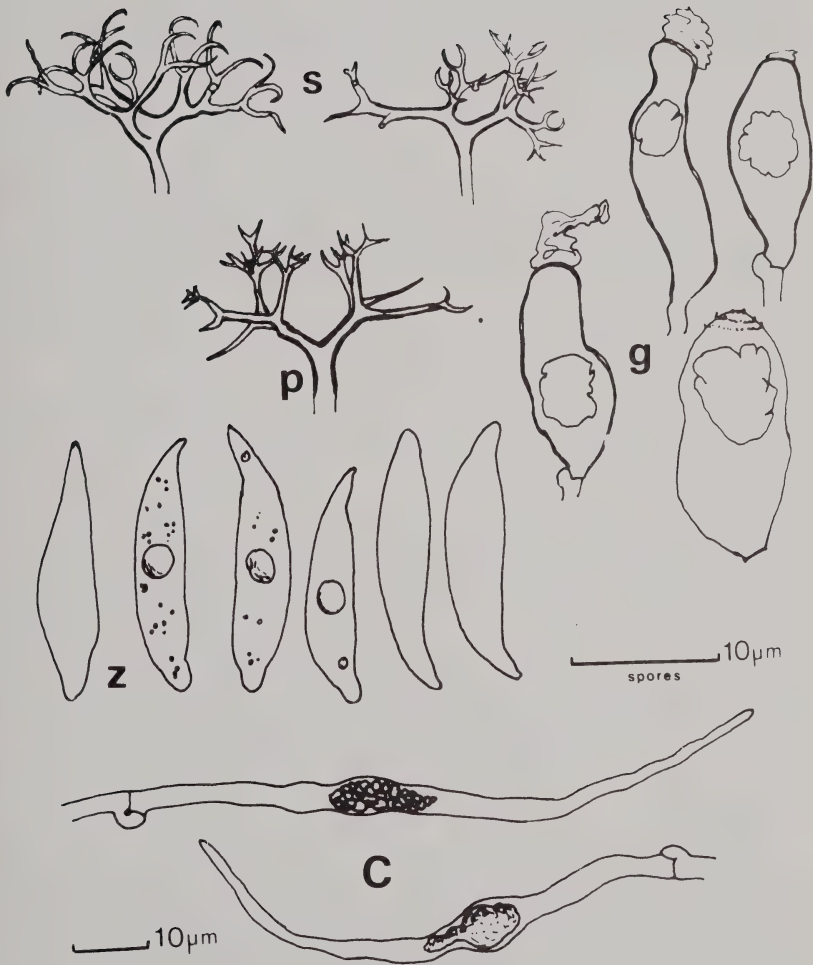


Fig. 8 - *Vararia intricata*, LY 8098 : dichophyses superficielles (s) in Melzer et une dichophyse profonde (p) in Congo ammoniacal, quatre gloeocystides (g) in Congo, spores (z) in KOH-phloxine, et (C) éléments gloeocystidiformes sulfo-négatifs en culture.

LY 8098 :

 A_1B_1 : 1-4-7-9 A_1B_2 : 3-8-10 A_2B_2 : 2-6 A_2B_1 : 5

LY 8166 :

 A_1B_1 : 1[★]-3-5-9-14-20-21 A_1B_2 : 2[★]-6-7-8-10-11-13-18-22 A_2B_2 : 12-18-19-23 A_2B_1 : 4[★]-15-16-17

INTERCOMPATIBILITES (3).- Les 38 appariements faits entre les monocaryons 8166 d'une part et 8036, 8098, 8174 et 8175 d'autre part ont été entièrement positifs après 10 jours.

POLYSPERME.- (LY 8098 et 8166)

Croissance : moyenne (boîtes couvertes en moins de 4 semaines).

Aspect : marge peu régulière. Duveteux, pelucheux à l'état jeune, le mycélium aérien âgé de 6 semaines est blanc, laineux à finement alvéolaire dans la partie jeune, il forme dans la moitié âgée soit des masses cotonneuses ou flocons saumon jaunâtre (7,5 YR 8/6 à 7/8) à isabelle (7/6) chez 8166, soit, chez 8098 une plage cotonneuse continue uniformément saumon jaunâtre pâle (8/4) pouvant atteindre contre le verre 8/6. Le revers, non coloré pour 8166, est isabelle (7,5 YR 6,5/6) pour 8098. Odeur nulle.

Microscopie :

mycélium aérien : il montre à côté de quelques hyphes étroites, x 1,5-2-(3) μm assez régulières, une majorité d'hyphes très irrégulières au contenu densément guttulé et à paroi mince ; ces hyphes portent des renflements nombreux et variés, x 5-15 μm contenant souvent une masse réfringente. Les boucles sont constantes. De très rares éléments terminaux légèrement renflés au contenu granuleux sont peut-être des gloeocystides sulfo-négatives ; ils montrent parfois un sommet vide avec quelques cloisons de retrait, mesurent 70-95 x 3,5-6-(8) μm et ne portent pas de papille (fig. 8 c). Dans le mycélium coloré accolé au verre, on peut observer des fibres régulières, x 2 μm environ, peu ou pas ramifiées, à paroi uniformément épaissie et congophile.

mycélium submergé : hyphes irrégulières, x 1,5 - 6 (8) μm , à boucles constantes, au contenu très guttulé, à paroi mince à nettement épaissie. Elles possèdent les mêmes renflements avec masses réfringentes, en outre des rameaux aux formes tourmentées peuvent s'enrouler et former de petits amas cérébriformes.

Cytologie : articles binucléés.

Oxydases :

ac.gallique : +++++,0	gaïacol : +++++, 0
p.-crésol : L (8098), M (8166)	tyrosine : -, 10-20 mm.

CODE : 2-3c-(8d)-(15)-32-(38 ou 39)-44-54-60-61.

4 - *Vararia minidichophysa* Boid. et Lanq., Bull. Soc. Mycol. France, 91 : 510, pl. XII B, 1975 (1976).

Etendu, très mince, à l'aspect d'une grosse pruine blanc grisâtre à l'oeil nu, discontinu sous la loupe.

Epais de 15-20 μm si l'on excepte les basides mûres émergentes. Sur quelques hyphes régulières, étroites, x 1-2 μm , à cloisons simples, des basidioles subsphériques, x 7-8 μm , et des DICHOPHYSES de 9-13 μm d'envergure, la plupart bien dextrinoïdes, plus nombreuses en surface ; elles ont un stipe indifférencié, non dextrinoïde, grêle, des branches de premier et deuxième ordre courtes peu distinctes et des rameaux ultimes longs, très grêles, souples, souvent incurvés ou involutés (ils atteignent 7x0,3 μm) (type capillaire). Parfois une dichophyse (immature ?) à rameaux obtus. GLOEOCYSTIDES assez nombreuses, bien visibles parce que longuement rétrécies et émergentes, 24-30 x 4-5 μm , au contenu huileux sulfo-anisique négatif, terminées par une courte schizopapille cylindrique. BASIDES utriformes larges de 5-5,5 μm au sommet, à 4 stérigmates. SPORES ovoïdes, (5,2)-6,5-8 x (4)-4,75-5,5 μm , avec bavette amyloïde surtout visible sur spores flétries, au contenu uniguttulé réfringent, binucléées. (voir fig. 9).



Fig. 9 - *Vararia minidichophysa* LY 8187 : vue générale en coupe in Melzer et spores in KOH-phloxine.

Récoltes :

LY 8187, sur rachis de *Cyathea arborea* morts verticaux, rive du Grand étang par St Sauveur, le 10 octobre 1976 ; on peut y ajouter sans doute LY 8052, sur arbuste mort debout, chemin forestier de Jules, Petit-Bourg, le 27 septembre 1976, qui n'a pas sporulé mais montre sur l'hyménium des spores de même type, un peu plus grandes (p. ex. $10 \times 6 \mu\text{m}$) toutefois.

Nous avons obtenu 8187 en culture ; nous n'en donnons pas la description car elle correspond à celle donnée pour le type Ivoirien (1976 p. 266). Il n'est malheureusement pas possible de confronter des haplontes africains et guadeloupéens, l'espèce étant homothalle.

Nous avons récolté (Domaine Duclos, le 28 septembre 1976, sur branchettes mortes en l'air) une espèce affine, elle aussi sans boucles et aux petites dichophysys capillaires (envergure $8-15 \mu\text{m}$) ; ses spores sont plus grandes, $9-12 \times 5-6-(6,5) \mu\text{m}$, oblongues à tendance amygdaloïforme, souvent plus larges dans la moitié apiculaire, et nous n'avons pu y déceler de gloeocystides ; le spécimen est aussi plus épais, $40-45 \mu\text{m}$, poudreux à subpulvérulent, jaunâtre (2,5 Y 8/4). A retrouver !

5 - *Vararia minispora* nov. sp. fig. 10 et 11.

Expansa, haerens, tenere ceracea, mox crassa (500-1000 μm) pallide e roseola brunnea, vel gilva ; carne rubiginosa, deinde brunnea, praeter stratum superficiale. Hyphis genitricibus fibulatis. Dichophysibus e brunneis luteolis, trunco pariete saepe incrassata, et ramis ultimis obtusis, saepe brevibus. Gloeocystidiis forma irregulari, saepe schizopapilla sursum praeditis, per S.A. incoloribus. Basidiis parvis, 19-25 x 3-3,5 μm , tetrasporis. Sporis subovatis, 2-4 x 2,5-3 μm , haud amyloideis, uninucleatis. Nuclei rite dividuntur ; culturae mono- et dicaryoticae oidia edunt. Tetrapolaris. Humi in ligno, Guadeloupe, HOLOTYPE LY 8078.

Etalé, très adhérent, céracé, tendre sous l'aiguille, pruneux, pouvant devenir épais avec marge amincie assez brusquement ; bien développé et en bonne végétation, sa surface est brun rosâtre pâle (5 YR 6/3), cannelle terne (7,5 YR 6/4) ou encore beige (10 YR 7/3 lavé de 7/2), il montre alors un cerne cannelle à la marge (7,5 YR 6,5/6). Il tire beaucoup plus sur le jaune quand il est mince (ou rongé en surface par une larve), il apparaît alors argillacé (2,5 Y 7/4). Avec l'âge ou en moins bonne végétation il devient alutacé (10 YR 8/4 à 7,5/4). Sa substance apparaît rouille puis brune, sauf en surface.

En herbier, sa couleur est beige (10 YR 7/3, vinaceous buff R.), ocre argillacé (1 Y 7/4), alutacé sale (vers 2,5 Y 7,5/4) et peut présenter un cerne plus sombre à la marge, beige brunâtre (10 YR 7/3 à 6,5/3 et même 6/3). La chair est brune (7,5 YR 5/4), stratifiée sous la loupe dans les exemplaires épais.

Epais couramment de 120 à 500 μm , il peut atteindre 1000 μm . Sur quelques hyphes à paroi mince, montrant des boucles, se dressent de suite des DICHOPHYSES jaune brunâtre, intriquées, ne s'assombrissant pas sensiblement dans KOH, congophiles à chaud mais non dextrinoïdes sauf dans la partie supérieure. Celles nées tout à la base ont un stipe cylindrique assez long et large, 20-40 x 2,8-4,5 μm , à paroi congophile mince dans la moitié inférieure et peu à peu épaissie (pouvant atteindre 0,8 μm au sommet),

et portent des branches naissant simultanément à 2 ou même 3 niveaux, ou au contraire regroupées en une tête sommitale. Les branches sont raides, à paroi épaissie, à disposition géométrique ; les rameaux ultimes sont subcylindriques obtus. Toutes les autres dichophyses ont un tronc plus étroit, $15-23 \times 1,8-3,2 \mu\text{m}$, sinueux irrégulier, à paroi souvent épaissie presque dès la base, portant au sommet des branches étalées (envergure $25-32 \mu\text{m}$) à paroi épaissie ; les rameaux ultimes sont généralement courts et toujours obtus (aspect subcoralloïde). S'y mêlent par endroit des éléments à paroi mince : hyphes génératrices peu régulières, $\times 1,8-2,5-(4) \mu\text{m}$, bouclées, des basides flétries et parfois des amas de spores.

GLOEOCYSTIDES peu remarquables pouvant naître dès la base, mais plus visibles en surface où elles sont parfois nombreuses et émergentes d'une dizaine de μm ; elles sont subcylindriques irrégulières, ou renflées dans la moitié inférieure et subfusiformes, parfois obtuses mais souvent à sommet conique terminé par une petite schizopapille, $25-42 \times 5-7-(10) \mu\text{m}$; leur paroi est mince ou à peine plus ferme que celle de l'hyphe porteuse ; elles montrent parfois une cloison de retrait qui isole le sommet flétri ; leur contenu peu remarquable ne réagit pas dans le sulfo-anisique. Les BASIDES sont petites, $19-25 \times 3-3,5 \mu\text{m}$ au sommet, un peu utriformes, atteignant $4,2-4,5 \mu\text{m}$ dans la moitié inférieure, généralement à 4 stérigmates, et peuvent émerger de $6-8 \mu\text{m}$ à maturité ; quelques basides à 2 ou 3 stérigmates. SPORES petites (d'où le nom) $3-4-(4,5) \times 2,5-3-(3,25) \mu\text{m}$, ($\bar{x} = 3,6 \pm 0,38 \times 2,88 \pm 0,23$ pour $N = 54$), subovoïdes courtes de face, à profil ventral aplati, à paroi un peu ferme, lisse, non amyloïde et sans bavette, au contenu homogène, uninucléé.

Récoltes :

LY 7702, sous un tronc couché au sol, aire de Petit David, Parc National, le 13 août 1975 ; LY 7648, sous un tronc au sol, Bras David, Parc National, le 4 août 1975 ; LY 7694, sur branche au sol et s'étalant dans les galeries de termites, départ de la trace Victor Hugues, au dessus de Carrère, le 12 août 1975 ; LY 8078, sur grosse branche tombée, Domaine Duclos, Petit-Bourg, le 28 septembre 1976, HOLOTYPE.

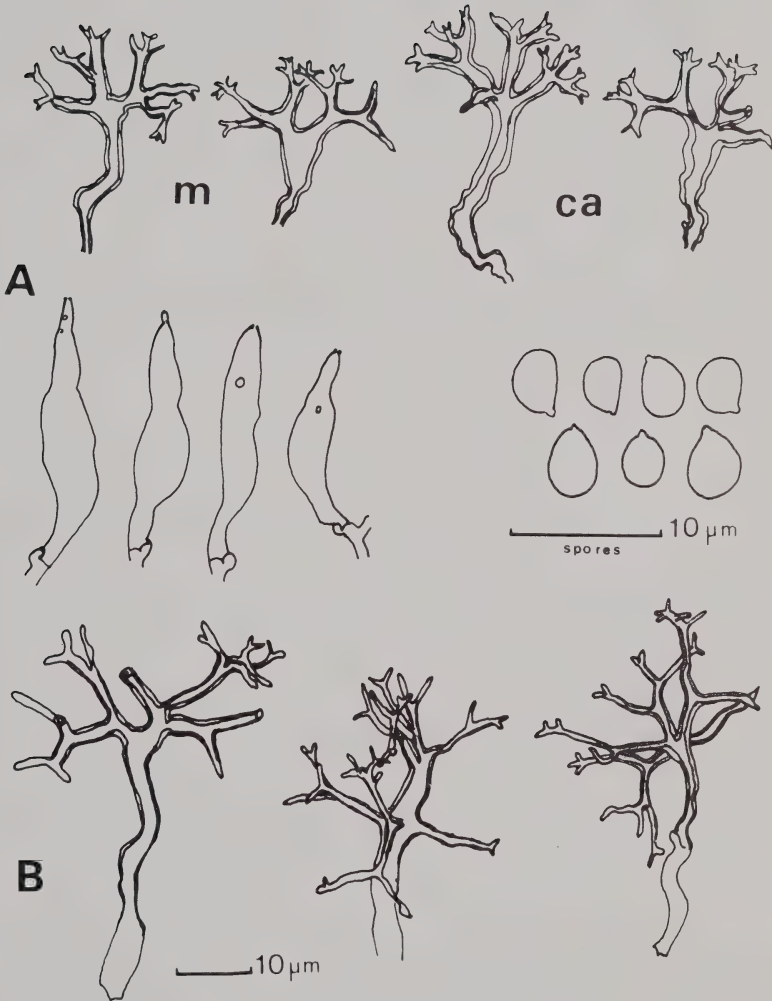


Fig. 10 - *Vararia minispora* A, LY 8078 TYPE : deux dichophyses superficielles in Melzer (m) et deux in Congo ammoniacal 60° C (ca), quatre gloecystides (in Congo 60° C) et des basidiospores (in KOH-phloxine) ; B, LY 7702 : trois dichophyses profondes.

V. minispora est étroitement apparenté à *V. ubatubensis* dont il a notamment les petites spores, la tendance à l'épaisseur avec chair brunâtre à brune. Il en diffère par sa couleur plus terne, ses dichophyses superficielles aux rameaux ultimes plus trapus, courts et obtus, l'absence de dichophyses basales géométriques en couche plus lâche et de dichophyses intermédiaires aux branches avortées. Il serait cependant souhaitable de disposer d'autres récoltes de *V. ubatubensis* pour en étudier les variations, et de cultures notamment monospermes pour d'éventuels appariements.

V. dussii se distingue de ces deux espèces par ses spores plus allongées et ses dichophyses superficielles à rameaux ultimes souples.

Caractères cultureux de *V. minispora* :

GERMINATIONS.- (8078) les spores émettent, en 48 heures, un à 3 filaments aux articles régulièrement uninucléés.

MONOSPERMES.- hyphes sans boucles aux articles uninucléés ; ils peuvent se désarticuler en d'innombrables arthrospores uninucléées.

POLARITE.- l'espèce est tétrapolaire :

A_1B_1 : 1-3-10

A_1B_2 : 2-4-7-8

A_2B_2 : 6-9

A_2B_1 : 5

La diploïdisation totale des monocaryons compatibles est lente (deux mois environ). Quelques fausses boucles dans les confrontations 2 x 9, 7 x 9 et 8 x 9.

INTERCOMPATIBILITE (3).- 7702 et 8078 sont intercompatibles

POLYSPERME.- (LY 7702 et 8078).

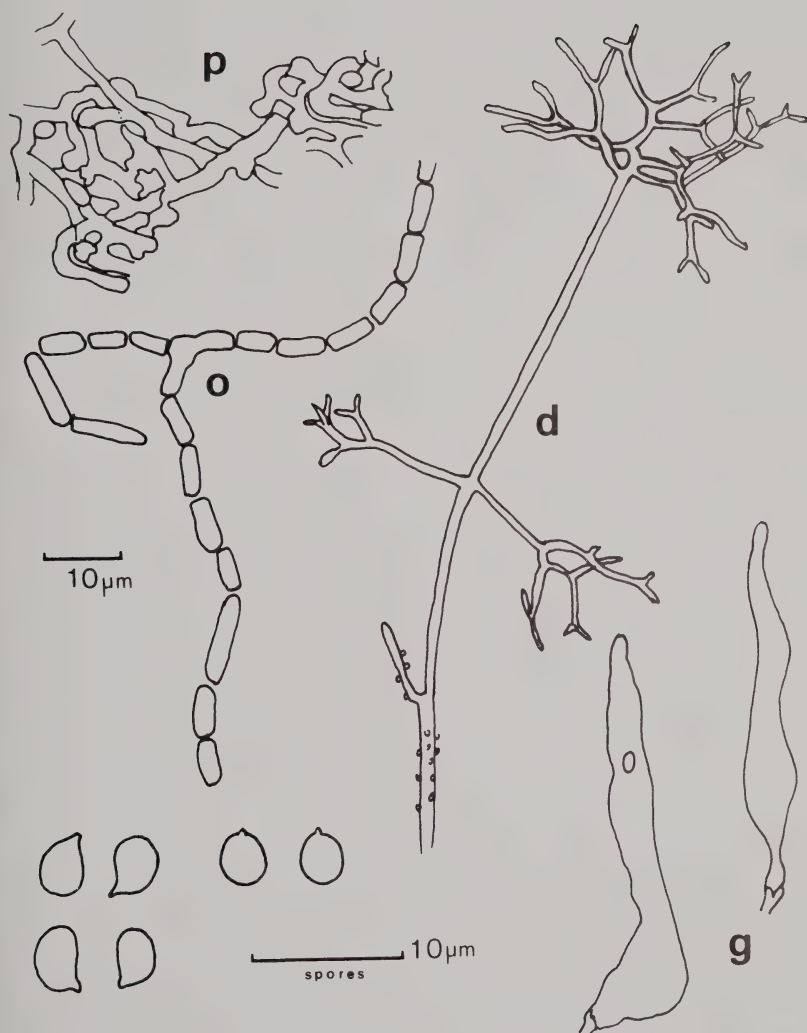


Fig. 11 - *Vararia minispora* LY 7702 Basidiome : deux gloecystides sans schizopapille (g), six basidiospores ; Culture : dichophyse (d) et oïdies (o) sur Hagem; hyphes submergées formant puzzle (p) dans culture de 6 semaines sur Nobles.

Croissance : moyenne (boîtes juste couvertes en 4 semaines)

Aspect : la marge est peu régulière, dressée, formée d'hyphes rayonnantes raides, élevées. Jeune, le mycélium aérien est par endroit lâche et élevé, fragile (il rappelle les soies d'un capitule de *Taraxacum*), ailleurs bas, réduit à quelques filaments. A 6 semaines le mycélium aérien est subfeutré, alutacé (vers 10 YR 8/4 à 8/6) dans la partie âgée ; dans la partie jeune il est pratiquement nul et la culture a un aspect nuageux ou marbré caractéristique ; parfois le mycélium aérien de la partie jeune est pelucheux et montre de fins granules ocre pâle (10 YR 8/8) à chamois (7/8). Dessous inchangé, pas d'odeur.

Microscopie :

Mycélium aérien : très fragile, il s'affaisse au toucher ; on y distingue :

1) des hyphes axiales régulières, x 4-6 μm avec rameaux plus étroits, x 1,5-3 μm , à paroi mince, contenu homogène et boucles constantes.

2) des dichophyses assez nombreuses, hyalines ou jaunâtres dans l'eau, de (12)-25-50-(70) μm d'envergure, à paroi plus ou moins épaissie aux rameaux ultimes courts. On observe fréquemment deux éléments assez symétriques disposés de part et d'autre d'une longue fibre large de 1,5-2 μm , terminée elle-même par une dichophyse bien dichotome (fig. 11, d).

3) des articles oléifères jaunâtres, 180-380 x 5-8 μm .

4) des hyphes se désarticulant en arthrospores rectangulaires, parfois un peu renflées (x 6-7 μm). Ces oïdies se forment en très grand nombre à l'obscurité ; la lumière semble avoir un effet inhibiteur.

5) de nombreuses masses huileuses sont accolées aux hyphes ; malgré de longues recherches aucune gloeocystide différenciée n'a pu être observée. Ce n'est que dans les granules ocre pâle que l'on peut voir des éléments renflés, 25-45 x 6-9-(10) μm pouvant être dénommés gloeocystides, mais ils sont alors associés à quelques basides à 4 stérigmates ; c'est un début de fructification.

Mycélium submergé : des hyphes régulières, x (1,5)-2-4-(6) μm à boucles constantes et à paroi mince, qui peuvent donner naissance à des rameaux compliqués, à paroi épaisse, imbriqués les uns dans les autres en forme de puzzle ; cette sorte de plectenchyme, dont la structure rappelle celle des crêtes du *V. insolita*, est ici submergée formant des

bandes plus opaques responsables de l'aspect marbré caractéristique des cultures (fig. 11, p).

Cytologie : articles binucléés.

Oxydases :

ac.gallique : +++++, 0-tr.	gaïacol : +++++, 0
p.-crésol : M	tyrosine : (+) à ++, 10 mm.

CODE : 2-3c-21-25d-35-36-38-44-54-60-61.

6 - *Vararia rhombospora* nov. sp. fig. 12

Expansa, tenuis, haerens, fragilis, e gilva murina. Hyphis genetricibus fibulatis. Dichophysibus superis dextrinoideis, ramis ultimis gracilibus et lentis. Gloeocystidiis per S.A. coloratis, schizopapilla globosa praeditis. Basidiis utriformibus, 30-38 x 5-7 μ m. Sporis a fronte rhomboideis, biapiculatis, 15-17 x 5-6,2 μ m, haud amyloideis, sine macula, uninucleatis. Nuclei rite dividuntur. In ligno emortuoso suspenso. Guadeloupe, HOLOTYPUS LY 7634.

Largement étalé, très mince, adhérent, fragile mais non pulvérulent sous l'aiguille, uniformément gris beigeâtre, à marge nette.

En herbier, aride, crème pâle (5 Y 9,25/3,2).

En coupe ne dépasse pas 100 μ m d'épaisseur ; il est formé dès la base de dichophyses enchevêtrées subhyalines non dextrinoïdes, mêlées à des amas cristallins parmi lesquels les hyphes génératrices grêles, x 1-2 μ m, rares, bouclées, sont très difficiles à observer. Les DICHOPHYSES inférieures ont un stipe étroit, à paroi un peu épaissie dans la moitié supérieure, des branches raides, bien dichotomes et des rameaux ultimes souples ; l'envergure de ces dichophyses est de 30-35 μ m. Au dessus de celles-ci, les dichophyses diminuent d'envergure et leurs ramifications sont plus nombreuses et serrées tandis que les rameaux ultimes sont fréquemment, c'est le cas très largement dominant près de la surface, étroits, effilés, sinueux, involutés, toutefois certains restent obtus ; les deux types de

rameaux ultimes peuvent coexister sur une même dichophyse. En surface, les dichophyses sont nettement dextrinoïdes, de faible envergure ($8-17\ \mu\text{m}$), compactes par la multiplicité des ramifications aux ultimes rameaux le plus souvent effilés, sinueux enroulés, longs de $2-5\ \mu\text{m}$ en général, mais pouvant atteindre parfois $10\text{ à }12\ \mu\text{m}$; elles tendent à prendre le type capillaire, mais la longueur des rameaux extrêmes n'étant pas nettement supérieure à celle des branches de premier ordre, leur type sera dit "subcapillaire". Assez abondantes GLOEOCYSTIDES étroitement claviformes ou subcylindriques à base grêle, $21-33 \times 4-5\ \mu\text{m}$, avec une schizopapille terminale subsphérique de $1,5-1,8\ \mu\text{m}$ de diamètre ; leur paroi est mince ou submince, leur contenu pailleté dans le Melzer, est sulfo-aldéhyde positif ; elles peuvent émerger légèrement. Basidioles ovoïdes larges jusqu'à $8-9\ \mu\text{m}$, donnant des BASIDES utriformes à paroi un peu ferme, $31-38 \times 5-6-7\ \mu\text{m}$ au sommet, $\times 6,5\text{ à }9\ \mu\text{m}$ vers le bas, avec 4 stérigmates atteignant $8,5\ \mu\text{m}$ de longueur. SPORES losangiques de face (d'où le nom), à tendance biapiculée, sublosangique de profil avec apicule un peu oblique, $(14)-15-17 \times 5-6,2\ \mu\text{m}$, ($\bar{x} = 15,59 \pm 0,68 \times 5,74 \pm 0,36$ pour $N = 17$), non amyloïdes et sans bavette, au contenu partiellement multiguttulé, et uninucléé. De face, la spore est symétrique par rapport à ses deux axes perpendiculaires, base et sommet sont pratiquement superposables.

Récolte :

LY 7634, sur liane morte en l'air, chemin reliant Grand Etang à l'As de Pique, le 31 juillet 1975, HOLOTYPE. Plusieurs récoltes faites en 1976 n'ont pas sporulé et ne peuvent être citées comme paratypes.

Par la taille de ses spores, ses boucles et ses dichophyses aux ultimes rameaux longs et souples, il pourrait dans une clé de détermination voisiner avec *V. firma* et *V. gillesii*. Toutefois ses spores losangiques sont très caractéristiques, et il n'a pas l'aspect et la couleur de ces derniers. Au microscope, *V. gillesii* s'en distingue de suite par ses grandes gloeocystides huileuses sulfo-aldéhydes négatives, et *V. firma* par ses grandes dichophyses, notamment celles de la couche inférieure. Sa ressemblance serait plutôt avec *V. minidichophysa* dont il a les gloeocystides étroites à papille terminale (mais chez ce dernier, elles sont sulfo-aldéhyde négatives) et à peu de chose près, les dichophyses. En présence d'exemplaires immatures, il n'y a que l'existence ou l'absence de boucles pour les différencier à coup sûr.

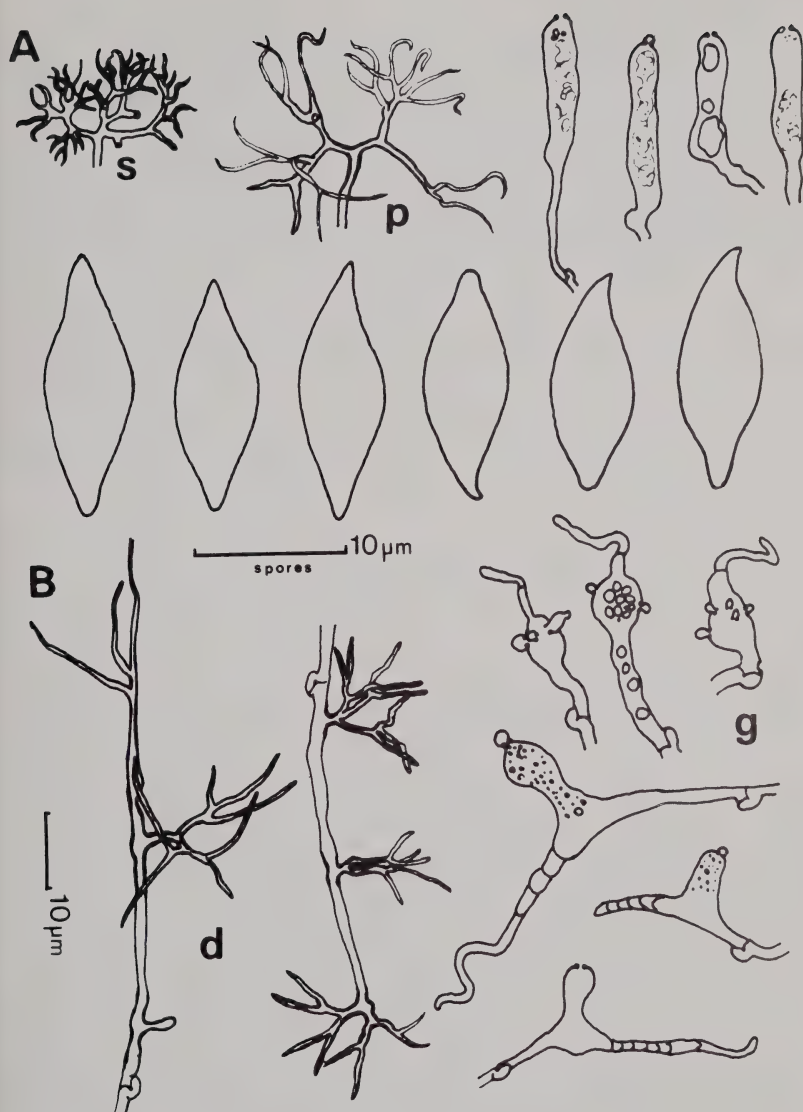


Fig. 12 - *Vararia rhombospora* LY 7634, TYPE ; A, Basidio-
me : une dichophyse superficielle (s) et une profonde (p)
in Melzer ; quatre gloecystides à schizopapille dont une
seule reste en place (in Congo ammoniacal 60° C), deux spo-
res de face et quatre de profil (in KOH-phloxine). B, cultu-
re : gloecystides à 1-5 schizopapilles (g) et dichophyses
sur Hagem (d).

Caractères cultureux de *V. rhombospora* :

MONOSPERME.- Ils ont été obtenus, un an après la récolte, grâce à la fructification de la culture polysperme. Les spores germent lentement. Les hyphes sont formées d'articles uninucléés sans boucles, et possèdent les mêmes différenciations que le dicaryon, notamment les sulfocystides faciles à observer.

POLARITE.- Les 30 monocaryons appariés se sont répartis en 3 groupes ; l'espèce est vraisemblablement tétrapolaire :

A_1B_1 : 3-10[☆]-13-14-15-19-26-28-29

A_2B_2 : 2[☆]-4-5-6-7-8-9-11-16-18-20-21-22-23-24-25-27-30

A_2B_1 : 1[☆]-12-17

Des fausses boucles sont observées en 1x3, 1x19, 10x12.

POLYSPERME.-

Croissance : rapide (boîtes couvertes en 3 semaines)

Aspect : la marge est régulière, appliquée ; le mycélium aérien totalement blanc, peu abondant, ne cache pas entièrement le milieu. La surface de la culture, mate et opaque est uniformément recouverte par un maigre aranéum. Le mycélium aérien est un peu plus abondant sur la bouture et contre le verre où, exceptionnellement et très localement, il peut se teinter d'alutacé (10 YR 8/3 à 8/4). Revers inchangé. Odeur aromatique légère.

Microscopie :

Mycélium aérien : hyphes régulières, quelques-unes larges de 3-4 μm , la plupart étroites, x 1-2-(3) μm , bouclées.. De très nombreuses petites gloeocystides de forme variée, x 4-7 μm , montrent une, ou le plus souvent plusieurs (2 à 5) schizopapilles (fig. 12, g), leur contenu est riche en gouttes jaune vif qui passent au violet-noir dans le sulfonisque. Contre le verre on peut trouver de rares dichophyses subcapillaires grêles de 10-25 μm d'envergure (fig. 12, d), et surtout de nombreuses fibres larges de 2-2,5 μm , à paroi épaisse congophile.

Mycélium submergé : les hyphes sont irrégulières, larges de 1-2-(3) μm , à paroi mince, bouclées. Parmi les nombreuses confrontations de monocaryons effectuées pour déterminer la polarité, on a pu remarquer parfois des grumeaux blancs submergés, très coriaces ; ils sont essentiellement constitués de fibres.

Cytologie : tous les articles sont binucléés et bouclés.

Oxydases :

ac. gallique : +++++,0	gaïacol : +++++, 0
p.-crésol : -	tyrosine : + à ++,0

CODE : 2-3c-8d-15-(25d)-32-36-38-43-54-(60)-61.

7 - *Vararia tropica* Welden, Mycologia, 57 : 516, fig. 1, 1965.

Décrit de Porto-Rico sur une récolte de 1913, ce *Vararia* a été retrouvé par C.E. Gomez en Argentine (cf. Boidin et coll. 1976), puis par R.L. Gilbertson et coll. sur *Prosopis juliflora* en Arizona (1976). Nous en avons récolté un spécimen typique en Guadeloupe :

Les données microscopiques ayant été figurées par Welden, par Boidin et Lanquetin (1976, pl. II fig. A) et Gilbertson et coll. (1976 fig. 35 p. 535) nous rappellerons seulement que c'est un champignon étalé très mince, adhérent, mat, rugueux et un peu fendillé sous la loupe en séchant, beige à ocre (10 YR 6,5/3 7/3 à 7/4) à marge similaire ou localement poudreuse concolore. Ses hyphes sont dépourvues de boucles. Les DICHOPHYSES supérieures de type capillaire ont une envergure de 15-20-(25) μm , leurs derniers rameaux longs et grêles pouvant atteindre 13 x 0,6 μm . Les GLOEOCYSTIDES généralement longuement rétrécies, atteignent 50 x 10 μm et sont terminées par une schizopapille subcylindrique ; elles contiennent quelques gouttes huileuses sulfo-aldéhyde négatives. Les BASIDES ont une paroi qui peut s'épaissir dans la moitié inférieure et alors gonfle et se délite par traitement alcalin à 60° C ; elles mesurent 35-45 x 7-7,5 μm au sommet, 10 μm au tiers inférieur.

Les spores que nous avons pu cette fois mesurer sur sporée, sont oblongues larges, $9-10,8 \times 7-8-(8,5) \mu\text{m}$, ($\bar{x} = 10,00 \pm 0,47 \times 7,71 \pm 0,35$, pour $N = 20$), ce qui cadre plus étroitement avec les mesures de A.L. Welden que les nôtres faites sur le carpophore type et publiées antérieurement. La paroi, un peu épaisse, n'est pas amyloïde, (fig. 13, A). La spore contient 2 noyaux. La sporée est rosâtre en masse.

Récolte :

LY 8069, sur branchettes ne touchant pas le sol, Domaine Duclos, Petit-Bourg, le 28 septembre 1976.

Il s'agit d'une espèce bien caractérisée, déjà reconnaissable à ses seules spores.

8 - *Vararia splendida* (Viègas) Boid. et Hallenberg, nov. comb.

Syn. : *Asterostromella splendida* Viègas, Bragantia, 5 : 256, pl. IV, 1945.

Après étude du type et communication des notes d'étude de N. Hallenberg, nous proposons la combinaison ci-dessus, et donnons une description :

En herbier, champignon étalé à marge brusque sans rhizomorphes, appliquée ; hyménium lisse, fragile sous l'aiguille, uniformément alutacé (10 YR 7,8/5,8 à 8/6).

Epais de 50 à 120 μm , il est essentiellement formé de dichophyses présentes dès la base ; elles sont jaune-brunâtre en surface. Hyphes génératrices rares, $\times 1,5-2 \mu\text{m}$ dans le sous-hyménium, montrant des boucles. DICHOPHYSES inférieures de 30-45-(60) μm d'envergure, formées d'un stipe long, $25-30 \times 2,5-4 \mu\text{m}$, à paroi un peu épaissie dans sa partie supérieure ; elle peut cependant parfois atteindre 0,5 μm à mi-hauteur ; branches de premier ordre raides à paroi épaissie (par exemple $3-6 \times 1,8 \mu\text{m}$ avec paroi de 0,4 μm) ; branches de deuxième ordre semblables mais plus courtes ; ultimes rameaux longs, souples, souvent incurvés ou même un peu enroulés à l'extrémité, $6-14 \times 0,3-0,4 \mu\text{m}$ (type "arborescent capillaire"). On passe vers la surface à des dichophyses parfois bien dextrinoïdes, à stipe plus

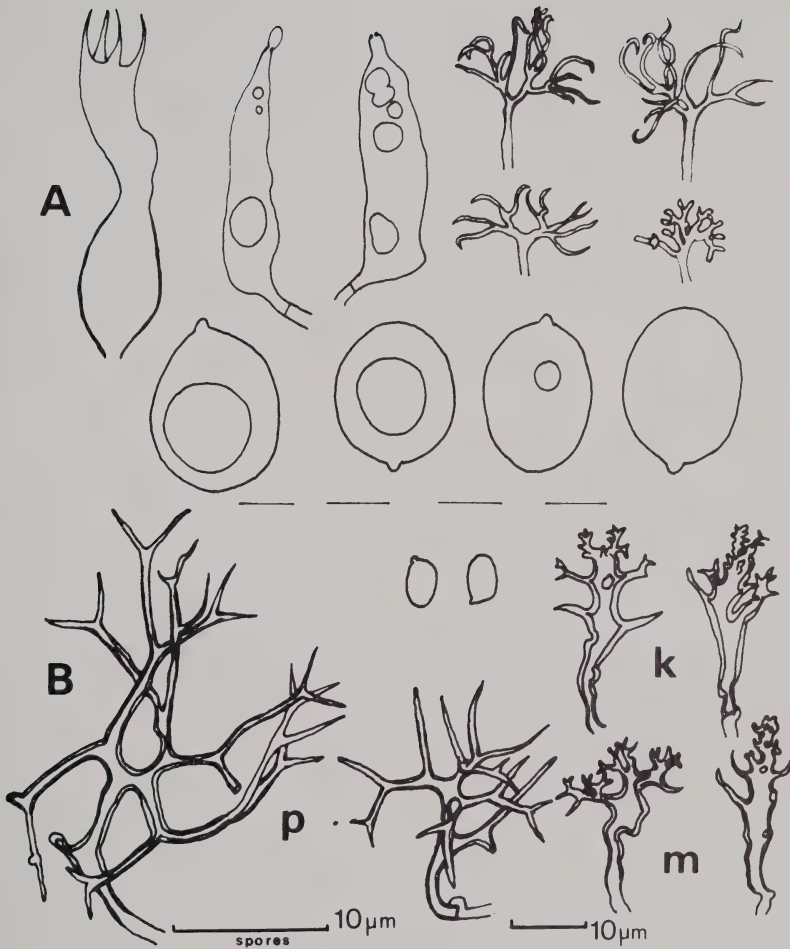


Fig. 13 - A-*Vararia tropica* LY 8069 : une baside et quatre dichophyses dont une aux rameaux courts (immatures ?) in Melzer ; deux gloeocystides à schizopapille (in Congo ammoniacal 60° C) ; quatre basidiospores (in KOH-phloxine).

B-*Vararia ubatubensis* (Viêgas), HOLOTYPE : deux dichophyses profondes (p) (in Congo ammoniacal 60° C) et quatre dichophyses moyennes et superficielles (k in KOH-phloxine, m in Melzer) ; deux basidiospores (in KOH-phloxine).

grêle à paroi mince sauf au sommet, aux branches de premier et deuxième ordre plus courtes mais aux ultimes rameaux toujours longs et souples (type "subcapillaire"). GLOEOCYSTIDES peu différenciées, irrégulièrement subcylindriques, obtuses, $40-58 \times 5,5-6,5 \mu\text{m}$, au contenu partiellement réfringent ; elles n'ont pas montré de schizopapille. BASIDES à 4 stérigmates, un peu resserrées à mi-hauteur, environ $20-35 \times 5,5-6 \mu\text{m}$, bouclées à la base.

Selon l'auteur de l'espèce, les SPORES sont oblongues allongées, $9-15 \times 3,5-4 \mu\text{m}$. Nous en avons vu peu, fusiformes à apicule un peu oblique, ou apparaissant subcylindriques, $9-12 \times 3-4 \mu\text{m}$, non amyloïdes et sans bavette. N. Hallenberg a pu en voir d'un peu plus grandes : $12-14,5 \times 3-4 \mu\text{m}$. (fig. 14).

Récoltes examinées :

BRESIL : sobre madeira caída na mata, Ubatuba, Est. Sao Paulo, 9 juin 1936, leg. A.S. Costa, det. A.P. Viêgas, Instituto Agronomico Campinas (IACM) n° 1843, HOLOTYPE. En accord avec N. Hallenberg, il faut ajouter des spécimens cités sous le nom de *V. pectinata* par A.L. Welden (1965) : SURINAME : NO 3002, Brokobakka, cacao plants between Affobakaka and Boko pongo, 6 juill. 1961, leg. A.L. Welden 2380 qui ne nous a pas montré de spores, mais elles mesurent selon le sachet d'herbier : $10-15 \times 3-6 \mu\text{m}$; NO 3001, near Suriname River on Paramaribo side, 3 juill. 1961, leg. A.L. Welden 2310. Welden (1965, p. 513) fait d'ailleurs remarquer que ses récoltes "differs in some degree from the type "de *V. pectinata*," lack the amyloïd fragments so prominent in the type". Nous avons montré (1976) que *V. pectinata* a sa place dans la section *Fusamyspora* distinguée de la section *Vararia* par l'amyloïdie de la paroi sporique lisse ou très faiblement ornée.

9 - *Vararia ubatubensis* (Viêgas) Boid. et Hallenberg, nov. comb.

Syn. : *Asterostromella ubatubensis* Viêgas, Bragantia, 5 : 257, fig. 1, 1945.

En herbier, étalé, adhérent, lisse, mat, uniformément cannelle testacé ($6,5 \text{ YR } 5,5/6$), assez épais, avec

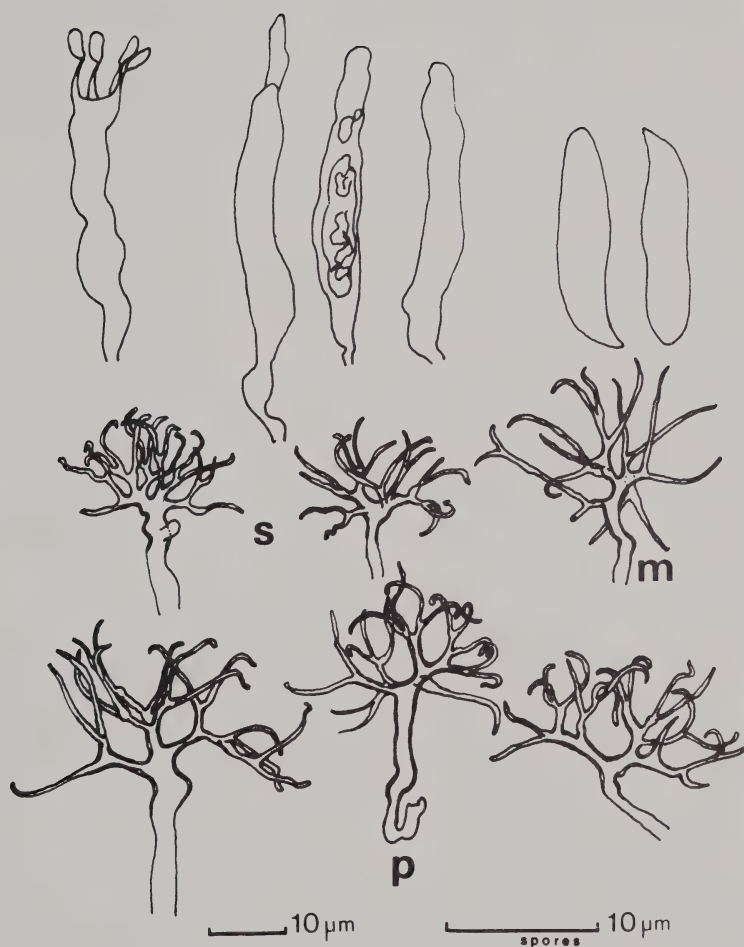


Fig. 14 -*Vararia splendida* (Viègas), HOLOTYPE : une baside et trois gloeocystides (in KOH-phloxine) ; deux spores d'après Hallenberg ; deux dichophyses superficielles (s), une dichophyse moyenne (m) et trois dichophyses posées sur le support (P) (in Melzer).

contexte de même couleur ; consistance de liège, cependant il se fend aisément à la suite de son support.

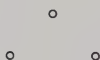
En coupe, épais de 200-300 μm ; dans toute l'épaisseur apparaissent des dichophyses jaune-brunâtre. Une zone inférieure d'épaisseur variable, mais ne dépassant pas 40 μm , apparaît plus lâche (elle est bien représentée sur la figure 1 de Viêgas) et formée d'éléments intriqués en tous sens ; : ce sont de rares hyphes génératrices bouclées, x 1,8-2 μm , à paroi mince ou faiblement épaissie non congophiles et des DICHOPHYSES géométriques assez raides, de 30-50 μm d'envergure, aux branches étalées rigides à paroi épaissie et congophile ; seuls les rameaux ultimes ont une paroi mince ; le stipe subcylindrique est à paroi un peu épaisse, plus faiblement que les branches de premier ordre. Dans le bois sous-jacent on peut observer des dichophyses semblables. Au dessus de cette couche, les éléments dichophytiques verticaux sont serrés, jaune-brunâtre, en partie seulement dextrinoïdes, mais toujours congophiles à chaud : ils possèdent généralement un tronc allongé sinueux, à paroi un peu à très épaisse (1,2 μm dans KOH 3 % p.ex.), s'élargissant peu à peu de la base au sommet. Beaucoup de troncs portent d'abord quelques appendices coniques et vers le sommet de courtes branches terminées par quelques diverticules courts ; ces dichophyses ont couramment une longueur totale de 25-45 μm et une largeur de 8-13 μm . Quelques autres, surtout en surface, forment des branches écartées, à nombreux rameaux ultimes courts (type "coralloïde") ; leur envergure est de 15-25 μm . Tous les passages existent entre ces deux types.

La diagnose originale signale des GLOEOCYSTIDES flexueuses rares, 24-30 x 4-5 μm , des BASIDES à 4 stérigmates, mais de taille curieuse : 12 x 4-5 μm , et l'absence de spores. Nous avons pu toutefois observer une dizaine de spores après de longues observations de scalps dans le Melzer, dont une fois 4 spores en place sur une baside flétrie. Ce sont de petites SPORES ovoïdes, 3-3,5-4 x 2-2,5 μm , à paroi lisse non amyloïde et sans bavette (☆).(Voir fig. 13 B).

(☆) Il nous semble indispensable que le Code international de Nomenclature botanique recommande désormais l'adjonction de sporées à tout spécimen type d'espèce nouvelle.

Récolte :

Sobre casca de planta indeterminada, Ubatuba, Est. Sao Paulo, Brésil, 9 juin 1936, col. A.S. Costa, det. A.P. Viêgas, *IAMC* n° 1856, *HOLOTYPE*.



Discussion :

Ayant choisi d'orienter nos efforts sur les *Lachnocladiaceae*, nous avons tenté, après une première étude des *Vararia* centrafricains, ivoiriens et gabonnais, une incursion dans le nouveau monde. Elle est beaucoup trop ponctuelle et brève pour mener à des conclusions. Nous nous contenterons d'exprimer quelques remarques.

Le mycologue, même en déplacement lointain, ne doit plus se contenter d'accumuler et de faire sécher un matériel hâtivement étiqueté qu'il étudiera mort après son retour. Il a désormais la possibilité de déplacements rapides, et peut en général au cours de ceux-ci faire aisément sur place un minimum d'observations sur le frais (couleurs codées, réactions aux sulfo-aldéhydes, étude microscopique rapide...) et obtenir des sporées pour dessins et mesures précises ultérieures, ou mieux encore des sporées aseptiques qui envoyées rapidement au laboratoire d'origine pourront en outre servir à la mise en culture. Avec les *Vararia* aux spores souvent fragiles supportant mal une dessiccation, il est prudent de tenter sur place, dès la sporulation, un ensemencement polysperme ; quelques tubes de milieu gélosé (par exemple les petits tubes vissés dits tubes à échantillons de 4 ml. de Wheaton Scientific) sont forts commodes en voyage ; il suffit d'y adjoindre une aiguille à ensemercer et une lampe à alcool. En 1976, les installations de l'INRA et un partage méthodique des tâches ont permis aux auteurs l'obtention de nombreuses cultures monocaryotiques.

Comme aura pu le remarquer le lecteur, les cultures permettent souvent beaucoup mieux que l'étude des carpophores desséchés certaines observations. Par exemple, la

recherche des boucles, souvent fort difficile sur exsiccata est très aisée en culture, et nous pouvons affirmer sans réticence qu'elles sont totalement absentes chez *V. gomezii*, comme elles le sont chez *V. minidichophysa* et *tropica*, autres *Vararia* homothalles. L'étude des gloeocystides, de la réaction de leur contenu aux sulfo-aldéhydes, la recherche des schizopapilles, peuvent être faites à loisir en culture.

En outre certaines données sont propres aux mycéliums ; soulignons la constance des conidiophores oedocéphaloïdes, que Stalpers (1974) réfère au genre *Spinger*, chez les *Dichostereum*, et la présence, notée pour la première fois, d'oïdies ou arthrospores chez certains *Vararia* (*V. dussii* et *V. minispora*) ; il s'agit de deux espèces poussant sur des bois au sol, souvent perforés de galeries ; les insectes pourraient avoir un rôle dans leur dispersion, l'obtention des cultures monocaryotiques a non seulement servi à établir la tétrapolarité des *Vararia dussii*, *intricata*, *minispora* et *rhombospora*, mais surtout a permis de très utiles essais d'intercompatibilité (3) :

1 - Cas des *Vararia dussii* :

Nous avons signalé des spores un peu différentes entre la récolte type LY 8115 et la récolte 8020 cependant intercompatibles. Nous présentons ci-après les mesures et calculs concernant les spores des 5 récoltes intercompatibles, spores mesurées in KOH 3 %-phloxine, sur sporées.

	moyenne ± écart-type $\bar{x} \pm s$	N	coef. de variation $s/\bar{x}$	extrêmes
8115	4,90 ± 0,4 x 3,5 ± 0,30	60	0,08 0,09	4 -6 x3 -4
8020	6,27 ± 2,6 x 3,23 ± 0,23	60	0,42 0,07	5,2-7,2 x3 -3,7
8167	4,42 ± 0,43 x 3,0 ± 0,22	24	0,09 0,07	3,8-5,2 x2,7-3,7
8184	4,82 ± 0,55 x 3,17 ± 0,20	17	0,11 0,06	4 -6 x3 -3,7
7638	5,45 ± 0,50 x 3,64 ± 0,37	16	0,09 0,10	4,7-6,2 x3 -4

On voit que l'écart-type est très important chez 8020 ; la variabilité ainsi soulignée est sans doute liée aux 10,90 % de spores à 2 noyaux ; elle est également bien mise en évidence par une courbe de Gauss à deux maximum (vers 5,9 et 6,8). Si l'on fait abstraction des spores incluses dans la deuxième partie de la courbe (et donc vraisemblablement des spores binucléées), la longueur moyenne

est alors de 5,92, taille encore sensiblement supérieure à la longueur moyenne des spores du type. La table de l'écart réduit montre nettement que nous avons deux populations différentes ($X = 4,12$ alors que la table indique une valeur limite de 1,96 au risque de 5 %).

Par ailleurs nous avons noté d'importantes variations de coloration des mycéliums entre les cinq souches : tandis que la récolte de 1975 (LY 7638) se montre pratiquement blanche sur Nobles à 6 semaines, les 4 autres souches se colorent plus ou moins intensément. Puisque toutes les souches appariées bouclent, ces différences (spores, couleurs des cultures) restent dans les limites des variations intraspécifiques.

2 - Cas des *Vararia intricata* :

Connu par une seule récolte africaine (Gabon LY 6272), ce champignon était dit "caractérisé par ses spores élancées et l'aspect particulier de ses gloeocystides" (Boidin et Lanquetin 1976). Si les spores et les dichophyses superficielles des 7 récoltes guadeloupéennes correspondent bien à celles du type, nous avons remarqué, selon l'âge des spécimens (?), de grandes variations dans la forme des gloeocystides. LY 8098, comme 8036, a les gloeocystides larges à sommet flêtri, et paroi épaissie du type gabonnais; LY 8166 a, au contraire, des gloeocystides allongées subfusiformes à paroi mince ; LY 8173 - 8174 et 8175 ont des gloeocystides de ce dernier type, mais montrant parfois une schizopapille terminale, associées à quelques gloeocystides plus courtes à paroi un peu épaissie. A l'exception du 8173 dont nous n'avons pas de mycélium monocaryotique, toutes les autres souches appariées avec 8166 ont rapidement formé des boucles.

Ces données sont à verser à l'actif des tests d'interfertilité-interstérilité et auraient pu illustrer l'exposé fait récemment à Lausanne dans le cadre du Symposium Herbette sur la notion d'espèce chez les champignons supérieurs (Boidin 1977).

Si nous avons pu utiliser les tests d'intercompatibilité entre souches guadeloupéennes et nous assurer que les variations constatées restaient dans les limites de l'espèce, nous n'avons pu, à notre grand regret disposer simultanément de cultures monocaryotiques africaines et américaines pour les quelques *Vararia* hétérothalles récoltés sur ces

deux continents. C'est ainsi que *V. intricata* type originaire du Gabon n'a pu être cultivé à l'arrivée des spores à Lyon en 1968, et qu'il n'existe pas de cultures américaines de *V. sphaericospora* Gilbertson ni de *V. pectinata* (Burt) Rog. & Jacks., espèces décrites d'Amérique du Nord, mais retrouvées en Afrique et obtenues en culture, la première du Gabon, la seconde de Côte d'Ivoire. Par contre, *V. minidichophysa*, dont nous avons des cultures originaires des deux rives de l'Atlantique est homothalle et ne peut être utilement apparié.

Pour progresser rapidement dans la connaissance d'un ensemble comme celui des *Lachnogladiaceae*, il serait très souhaitable que s'établisse, notamment pour les spores et les cultures, une coopération très étroite entre mycologues éloignés.

Remerciements

Notre gratitude s'adresse tout d'abord à Monsieur Coleno, directeur de la Station de Pathologie végétale de l'INRA de Petit Bourg, ainsi qu'à Monsieur Fournet botaniste éminent, pour leur accueil très cordial.

Pour effectuer au mieux cette mise au point, nous avons mis à contribution de nombreux collègues : le Dr Siepmann d'Hann-Münden (Allemagne) a obtenu à notre intention la fructification de plusieurs *Dichostereum* ; Niels Hallenberg de Göteborg (Suède) nous a communiqué divers renseignements et notamment des notes et dessins concernant les espèces de Viégas ; P.L. Lentz de Beltsville (Maryland) a bien voulu comparer nos descriptions aux notes qu'il possède sur les spécimens de J. Rick. ; A.L. Welden nous a aimablement prêté divers spécimens de la zone Caraïbe ; qu'ils soient tous sincèrement remerciés.

Enfin nous exprimons notre reconnaissance au Professeur J. Eriksson de Göteborg (Suède) et au Dr Derek A. Reid des Royal Botanic Gardens de Kew (Angleterre) pour la lecture critique de ce manuscrit ; ainsi qu'à Monsieur H. Romagnesi pour les traductions latines.

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Following interesting collections in Guadeloupe in 1975-76, a detailed account is presented of all species actually known to date in Central America.

The genus *Dichostereum* Pilát, type *Asterostromella dura* Bourd. & Galz., is resurrected for those species of *Vararia* with warted and amyloid, subglobose spores, showing in cultures conidiophores of the *Spiniger* Stalpers (1974) type. *D. peniophoroides* (Burt) is intersterile with the closely related *Dichostereum* species already studied by Lanquetin (1973).

In the genus *Vararia*, three new species, *V. dussii*, *minispora* and *rhombospora* are proposed, and four others are notified : *V. tropica* Welden, *minidichophysa* Boid. & Lanq., *intricata* Boid. & Lanq. and *gomezii* Boid. & Lanq., *V. tropica* which is now known from Puerto-Rico, Argentina, Arizona and Guadeloupe seems to be restricted to America. On the other hand, *V. minidichophysa* and *V. intricata* of tropical Africa and *V. gomezii* of North Argentina and perhaps also of Africa have been collected for the first time in Central America. These species may have a wider distribution in Neotropica.

The authors emphasize the importance of making a few observations during field trips on the fresh material (colours, sulfuric-aldehyde reaction...) and above all of collecting each time aseptic spore prints for accurate measurements and cultures.

The cultural characters are indicated for the three new species as well as for *V. gomezii* and *intricata*.

The principal microscopic characters are :

SPORES : shape and size when mature (on spore prints), amyloidity, "bavette" (= adaxial plaque), number of nuclei, color of print.

DICHOPHYSES : differentiation of the stipe, of the branches and ultimate ramifications (short or long and flexible), spread, variations in the basidiocarp between the base and the surface.

GLOEOCYSTIDIA : shape, reaction of the content in sulfuric-aldehydes, presence or lack of schizopapilla.

CLAMP-CONNECTIONS : presence or absence, eventually inconsistency.

These characters have enabled us to differentiate the species and to make a key for their determination. If, in the French text, we have initially distinguished the species with or without clamp-connections, we give below a key where the character appears later, and where initial separation is made on spore characters.

KEY to *VARARIA* and *DICHOSTEREUM*
actually known in Central America

- 1-Spores globose amyloid 2
- 1-Spores not amyloid (or only small adaxial amyloid plaque or "bavette") 4
- 2-Spores globose smooth ; superficial dextrinoid hyphae with final ramifications long, slender and enrolled
..... see *Scytinostroma albo-cinctum* *
- 2-Spores globose or subglobose, warted
..... (*g. Dichostereum*) 3
- 3-Gloeocystidia large and broad ($> 10 \mu\text{m}$), finally with solid content ; spores strongly warted, the wall of which swells in KOH
..... *D. peniophoroides* (Burt), p. 285
- 3-Gloeocystidia narrower ($< 10 \mu\text{m}$) ; spores with smaller warts, and wall remaining thin in KOH 3 % *D. pallescens* (Schw.)
- 4-Spores small, ovoid or shortly oblong, 3-6, $5 \times 2-3,5 \mu\text{m}$ 5
- 4-Spores larger ; basidiocarps thin with white or pale context (except *S. phaeosarcum*) 8
- 5-Rhizomorphs and fiber hyphae present ; basidiocarps thin without clamp-connections
..... *V. fibra* Welden
- 5-Without rhizomorphs or thick walled hyphae ; basidiocarps thick (500 to 3000 μm) with brownish context ; hyphae with clamps 6

* Pour *Scytinostroma albo-cinctum* (Berk. & Br.) Boid. & Lanq. et *S. phaeosarcum* Boid. & Lanq. voir Boidin et Lanquetin (1976)

- 6-Superficial dichophyses with final ramifications long and flexible ; gloeocystidia positive in sulfuric-aldehyde ; spores $4-6,5 \times 3-3,75 \mu\text{m}$
 *V. dussii* B. & L., p. 292
- 6-Superficial dichophyses with final ramifications very short 7
- 7-Dichophyses with branches well developed, divergent with final ramifications cylindric, short, obtuse ; spores subovoid, $3-4 \times 2,5-3,25 \mu\text{m}$ *V. minispora* B. & L., p. 311
- 7-Dichophyses in the depth in loose layer, with final branches conical ; dichophyses in the middle with sinuous trunk with more and less abortive ramifications ; spores ovoid, $3-4 \times 2-2,5 \mu\text{m}$... *V. ubatubensis* (Viêgas) p. 324
- 8-Spores ovoid or oblong, $6,5-11 \times 4-8,5 \mu\text{m}$; hyphae without clamp-connections 9
- 8-Spores elongated fusiform ; hyphae with clamp-connections or not 11
- 9-Basidiocarps thick with brown flesh ; dichophytic hyphae with final ramifications cylindric obtuse ; spores subcylindric short, $8-10 \times 4-5,25 \mu\text{m}$
 see *Seytinostroma phaeosarcum* *
- 9-Basidiocarps very thin, with pallid flesh ; hair-like dichophyses (final ramifications very slender, long flexible) 10
- 10-Spores oblong wide, $9-11 \times 7-8,5 \mu\text{m}$
 *V. tropica* Welden p. 321
- 10-Spores ovoid, $6,5-8 \times 4,75-5,5 \mu\text{m}$
 *V. minidichophysa* B. & L., p. 309
- 11-Spores narrow, $\times 2,5-4,2 \mu\text{m}$ 12
- 11-Spores wider, $\times 4,8-6,2 \mu\text{m}$ 15
- 12-Final ramifications of the dichophyses very short, obtuse ; spores $10-13 \times 2,5-3 \mu\text{m}$
 *V. trinidadensis* Welden
- 12-Final ramifications of the superficial dichophyses long, slender and flexible.. 13
- 13-Hyphae without clamp-connections ; spores $16-17,5-(22) \times 2,5-3,25 \mu\text{m}$
 *V. phyllophila* (Mass.)
- 13-Hyphae with clamp-connections 14

- 14-Spores oblong to fusiform, $9-15 \times 3,5-4 \mu\text{m}$;
all dichophyses with final ramifications
long and flexible
..... *V. splendida* (Viègas), p. 322
- 14-Spores lengthly navicular, biapiculate,
 $15-18-(21) \times 3,2-4,2 \mu\text{m}$; deep dichophyses
with final ramifications conic straight
..... *V. intricata* B. & L., p. 303
- 15-Superficial dichophyses with final ramifications
numerous and short (coralloid type) ;
gloeocystidia sulfuric aldehyde negative with
thickened wall ; spores $12,5-15 \times 4,8-6 \mu\text{m}$;
hyphae without clamps .. *V. gomezii* B. & L., p. 299
- 15-Superficial dichophyses with final ramifications
slender and flexible ; gloeocystidia
narrow, $\times 4-5 \mu\text{m}$ positive in sulfuric-aldehyde,
with schizopapilla ; spores $15-17 \times 5-6,2 \mu\text{m}$,
rhombic in front ; hyphae with clamp-connections ..
V. rhombospora B. & L., p. 317

Though our knowledge is still very fragmentary it seems that the genus *Vararia* is very well represented in tropical America as it is in similar parts of Africa. We had already noted (1976) that *V. sphaericospora* Gilberts. and *V. pectinata* (Burt) and perhaps *V. gomezii* are common to both continents and to these we must now add *V. intricata* and *minidichophysa*. Unfortunately it has not been possible to mate cultures from these two continents : as in the case of homothallic species (*V. minidichophysa*, *gomezii*) or because we have been unable to dispose simultaneously cultures of the heterothallic species from the two sides of the Atlantic.

A plea is made for international collaboration, not only for the loan or exchange of specimens, but especially for the exchange of viable spore prints or cultures. In effect, the rapid progress of the study of *Laehnocladiaceae* (as of other families) make it indispensable for the future that there should be collaboration between mycologists throughout the world. Any collaboration in this direction would be most welcome and could form the basis of common publication.

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Vol. VI, No. 2, pp. 337-340

October-December 1977

TYPE STUDIES IN THE GENUS PEZIZA: SPECIES DESCRIBED
BY BERKELEY AND CURTIS FROM THE UNITED STATES
NORTH PACIFIC EXPLORING EXPEDITION (1853-1856)

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The genus *Peziza*, once used inclusively for almost all large Discomycetes, is now restricted to the fleshy, operculate Discomycetes which have iodine-positive asci and complex excipules built primarily of large globose cells and interwoven hyphae. Because of the former broad application of this generic name there are thousands of species referred to it. Of these, only a small proportion are truly *Peziza* in the restricted sense of contemporary authors (Korf 1972, Rifai 1968). Moreover, many species referred to *Peziza* have not been critically reexamined.

A set of *Pezizas*, described by Berkeley and Curtis (1860), were collected by Charles Wright on the United States North Pacific Exploring Expedition. The expedition visited Hong Kong, the Bonin Islands, Japan, and the Siberian side of the Bering Straits. The original descriptions are scanty, in part because the official report of the expedition was never published and in part because of Berkeley's style and habit. None of the species described by Berkeley and Curtis in *Peziza* can remain in the genus as currently circumscribed. The specimens studied are deposited in the Farlow Herbarium. They are presumed to be isotypes.

Peziza japonica Berk. & Curt., Proc. Amer. Acad. Arts
4: 127. 1860.

≡ *Plectania japonica* (Berk. & Curt.) Sacc., Syll. Fung.
8: 163. 1889.

On roots upon hillsides. Tokunosima, Japan. April 30,
1855.

Berkeley and Curtis compared the external appearance of this species with *Peziza melaena* Fr., now *Pseudoplectania*, and noted its elliptical spores. *Peziza japonica* agrees in all respects with *Plectania melastoma* (Sow. ex Fr.) Fuckel and should be considered a synonym.

Peziza boninensis Berk. & Curt., Proc. Amer. Acad. Arts 4: 127. 1860.

≡ *Humaria boninensis* (Berk. & Curt.) Sacc., Syll. Fung. 8: 139. 1889.

On dead leaves on hillsides. Bonin Islands. Oct. 23, 1854.

Ito and Imai (1937) synonymized this species with *Phillipsia domingensis* (Berk.) Berk. It differs from that species and all others reported in the genus in occurring on leaves rather than on dead wood. *Phillipsia domingensis* is quite variable morphologically, but *Peziza boninensis* agrees with the description of it given by Denison (1969). The occurrence of a *Phillipsia* on leaves suggests a relationship with *Nanoscypha*.

Peziza insititia Berk. & Curt., Proc. Amer. Acad. Arts 4: 127. 1860.

On dead wood covered with leaves. Bonin Islands. Oct. 23, 1854.

Ito and Imai (1937) based the genus *Boedijnopeziza* on this species. Rifai (1968) gives complete synonymy. I have previously (Pfister 1973) stated the arguments for and against recognition of the genus *Boedijnopeziza*. Until accurate field observations are carried out to determine the mode of apothecial development and the origin of the marginal hairs, there is little justification for placing this species in a separate genus.

I have recently examined a collection of this species from India (BPI). It is the only collection of this species I have seen from the Indian subcontinent.

Peziza lepida Berk. & Curt., Proc. Amer. Acad. Arts 4: 127. 1860.

≡ *Sarcoscypha lepida* (Berk. & Curt.) Sacc., Syll. Fung. 8: 154. 1889.

On burnt earth of hillsides. Japan. Sept. 8, 1855.

Rifai (1968) synonymized this species with *Geopyxis carbonaria* (Alb. & Schw. ex Pers.) Sacc. My studies

confirm Rifai's conclusions.

Peziza verruculosa Berk. & Curt., Proc. Amer. Acad. Arts 4: 127. 1860.

≡ *Geopyxis verruculosa* (Berk. & Curt.) Sacc., Syll. Fung. 8: 68. 1889.

On stony hills. Bering Straits. Aug. 11, 1855.

This is the arctic-alpine form of *Helvella acetabulum* (Fr.) Quél. described by Dissing (1966). Berkeley and Curtis described it as being violet-tinged. In dried condition it has whitish pustules at the margin. Berkeley and Curtis's comparison of this species with *Peziza nigrella* Pers. ex Fr. (≡ *Pseudoplectania nigrella* (Pers. ex Fr.) Fuckel) seems only to have been based on the dark pigmentation of the two species.

Peziza porphyra Berk. & Curt., Proc. Amer. Acad. Arts 4: 128. 1860.

≡ *Sphaerospora porphyra* (Berk. & Curt.) Sacc., Syll. Fung. 8: 188. 1889.

On banks by the roadside, Simoda, Japan. May 25, 1855.

The fungus was collected on twigs and soil. It is identical to *Pseudoplectania nigrella* (Pers. ex Fr.) Fuckel.

Peziza leucophaea Berk. & Curt., Proc. Amer. Acad. Arts 4: 128. 1860.

≡ *Erinella leucophaea* (Berk. & Curt.) Sacc., Syll. Fung. 8: 509. 1889.

On dead sticks, Simoda, Japan. May 14, 1855.

This is a species of *Dasyscyphus* S. F. Gray. It has filiform ascospores and lanceolate paraphyses. The hairs are brown-walled, rough, septate, and more or less blunt. *Peziza leucophaea* (Pers.) Nyl. (1869) is a later homonym.

Peziza inconspicua Berk. & Curt., Proc. Amer. Acad. Arts 4: 128. 1860.

≡ *Trichopeziza inconspicua* (Berk. & Curt.) Sacc., Syll. Fung. 8: 430. 1889.

On dead wood. Bonin Islands. Nov. 1854.

Berkeley and Curtis did not mention microscopic features. I found neither asci nor ascospores but saw scattered encrusted clavate structures which appear to be cystidia. It appears to be a cyphellaceous fungus.

Peziza hongkongensis Berk. & Curt., Proc. Amer. Acad. Arts 4: 128. 1860.

= *Helotium honkongense* (Berk. & Curt.) Sacc., Syll. Fung. 8: 223. 1889.

On dead twigs. Hong Kong.

This short stalked yellow-orange fungus is a *Hymenoscyphus* species. Its excipular structure is similar to that of *Hymenoscyphus miniatus* (Pat.) Dennis. The ascus pore is iodine-positive. The ascospores are 23-27 x 4-5 μ m and multiguttulate. The paraphyses are filiform.

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MYCOTAXON

Vol. VI, No. 2, pp. 341-355

October-December 1977

SECTIONAL NOMENCLATURE IN THE GENUS *COPRINUS*

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Summary

Twelve sections are presently recognized by the author in the genus *Coprinus* s.l. (Basidiomycetes, Agaricales, Coprinaceae). The nomenclature associated with them and its status is critically reviewed. One new taxon is proposed: *Coprinus* section *Insignes*. New sectional status is proposed for the *Domestici* and *Auricomis* groups. Section *Veliformes* is emended in circumscription. *Coprinus stercoreus* and *Coprinus congregatus* are designated species lectotypicae for sections *Veliformes* and *Glabrati* respectively. As an aid to stabilization of infrageneric nomenclature in the genus, lectotypes are also designated for fifteen taxa listed in synonymy.

Résumé

A présent douze sections sont acceptées par l'auteur pour le genre *Coprinus* s.l. (Basidiomycetes, Agaricales, Coprinaceae). La nomenclature y associée est considérée d'une manière critique. Un nouveau taxon est proposé: *Coprinus* section *Insignes*. Un nouveau rang sectionnel est proposé pour les groupes *Domestici* et *Auricomis*. Section *Veliformes* est réduite en circonscription. *Coprinus stercoreus* et *Coprinus congregatus* sont nommés species lectotypicae pour sections *Veliformes* et *Glabrati* respectivement. Au bénéfice de stabilisation de nomenclature chez le genre, lectotypes sont nommés aussi pour quinze taxa en synonymie.

In preparing a monograph of the genus *Coprinus* for North America, it became apparent to me that the infrageneric nomenclature for *Coprinus* has been confused. To

help remedy this situation, this paper details the use of most names which have been published for subdivisions of the genus. It also provides the correct names for twelve sections, three of which are new. Correct infrasectional nomenclature will be presented in subsequent publications.

Fries (1821) initially treated *Coprinus* as a unit within the genus *Agaricus*. There, he did not further group the species. Soon, however, Fries (1825) raised *Coprinus* to generic status, and in the *Epicrasis* (1838) he divided it into two artificial assemblages, tribe *Pelliculosi* and tribe *Veliformes*. The former includes *C. comatus*, the type species of the genus. These names are not valid, contravening Article 33 paragraph 3 of the International Code (Stafleu et al. 1972). Also, they are not exempted by Article 33 paragraph 4; it being restricted to relevant components of Fries' *Systema* (1821, 1828).

Without specification of rank, the genus was further subdivided by Fries (1838) into the *Comati*, *Atramentarii*, *Picacei*, *Tomentosi*, *Micacei*, *Glabrati*, *Cyclodei*, *Lanattuli*, *Furfurelli*, and *Hemerobii*. Fries (1849, 1874) sustained this classification in later treatises.

Among the subsequent authors who in some way provided an infrageneric classification for *Coprinus*, many for the most part followed the Friesian system and nomenclature (Cooke 1871; Morgan 1883; Quélet 1886; Stevenson 1886; Massee 1892; Patouillard 1900; McIlvaine 1902; W. G. Smith 1908; Pennington in Kauffman 1918). Berkeley (1860) and Rea (1922) also employed Friesian subdivisions, but deleted his nomenclature. Others, however, as well as some of those cited above in other of their works, provided new (to varying degrees) infrageneric classifications with partially to completely different nomenclature (Karsten 1876; Patouillard 1887; Quélet 1888; Hennings in Engler & Prantl 1897; Ricken 1910-1915; Bigeard & Guillemin 1913; J. E. Lange 1915; Killermann in Engler & Prantl 1928; Konrad & Maublanc 1930). In his revision, Massee (1896) numbered, without naming, his six subdivisions of the genus. More recently, compilations such as those of Singer (1951, 1962b, 1975), Kühner & Romagnesi (1953), and Moser (1967) have employed, in various combinations, some Friesian and some non-Friesian nomenclature. The latter has been primarily taken up from the *Coprinus* studies of Jakob Lange (1915, 1939).

The acceptance by the 1975 International Botanical Congress at Leningrad (Voss 1976; see also Comments Rapporteurs [p. 219] in Stafleu & Voss 1975) of Proposal 107 by Brummitt et al. (1974) is important to stabilization of infrageneric nomenclature. This addition to Article 35 of the International Code makes it possible to determine priority, if it has been established, for early names which were validly published, but without

clear indication of rank. As will be noted below, this is the status of most of the names in *Coprinus* which often have been considered sectional or subsectional. It will also be noted that Leigh Pennington (in Kauffman 1918) is the principal author to have assigned rank to the valid infrageneric names of Fries. Fortunately, though eighty years intervened, most of these Friesian names were not superseded, and from 1918 have priority at the sectional level.

Summarized below is most of the nomenclature associated with the sections in *Coprinus* which are presently recognized. Because of doubt about its status in the Coprinaceae, *Coprinus* section *Psathyrellopsis* Locquin (1955) is not acknowledged as a distinct taxon or included in synonymy. This is also the case with two unranked groups in the genus which were proposed by Patouillard (1900) and W. G. Smith (1908) respectively. On the other hand, certain obviously invalid sectional names, such as those recently circulated again by Shaffer (1968), have been included due to the notice they have received. The latter names were previously used in Smith & Shaffer (1964), where the junior author recommends they be ignored. I would suggest, however, that in order to avoid possible nomenclatural confusion, one should follow the botanical code's Recommendation 34A (Stafleu et al. 1972). In addition, Locquin's (1956) apparently purposely invalid names are also inserted. Full bibliographic citation for abbreviated references (e.g., 1838:242) is given in the list of references (p.

1. COPRINUS section COPRINUS

Type species: *C. comatus* (Müll. ex Fr.) S.F.Gray
[Lectotype of *Coprinus* [Pers.] S.F.Gray, selected by Earle (1909).]

Coprinus tribe *Pelliculosi* Fr. 1838:242. [Invalid, Art. 33 par. 3.]

Coprinus sect. *Pelliculosi* Fr. ex Cooke 1871:
161. [Invalid, Art. 32 & 22 par. 1.]

Coprinus tribe *Pelliculosi* *Comati* Fr. 1838:242.
[Validly published name (*Coprinus Comati*) without rank or priority, Art. 35 (Leningrad Code; typified by *C. comatus*, Art. 22 par. 4.)]

Coprinus Pelliculosi sect. *Comati* (Fr.) Penn.
in Kauff. 1918:207,209. [Invalid, Art. 32 & 22 par. 1.]

Coprinus sect. *Eucoprinus* Pat. 1887:126. [Invalid, Art. 32, 21 par. 3, 22 par. 1.]

Coprinus Pelliculosi Annulati Quél. 1888:52 non Karst. 1876 nec J.Lange 1915. [Illegitimate name (*Coprinus Annulati*), par. 2 of Art. 45 & 64; species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray]

Coprinus subg. *Volvocoprinus* sect. *Annulati* Henn. in E.&P. 1397:208. [Invalid, Art. 32 & 22 par. 1.]

Coprinus Comati Annulati J.Lange 1915:36 non J. Lange 1915:37 nec Karst. 1876 nec Quél. 1888. [Illegitimate name (*Coprinus Annulati*), Art. 64 par. 2; species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray.]

Coprinus sect. *Comati* subsect. *Annulati* Sing. 1951:459. [Subsectional epithet should be treated as if new, Art. 72; illegitimate, Art. 64 par. 2; typified by *C. comatus* fide Singer (1951).]

Coprinus subg. *Volvocoprinus* sect. *Volvati* Henn. in E.&P. 1897:208. [Species lectotypica: *C. sterquilinus* (Fr.) Fr.]

Coprinus Volvocoprinus Rick. 1910:56. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray.]

Coprinus subg. *Volvocoprinus* sect. *Annulati Pselliophora* Killerm. in E.&P. 1928:233. [Validly published name (*Coprinus Pselliophora*) without rank or priority, Art. 35 (Leningrad Code); based on *Pselliophora* Karst. 1879 (illegitimate, Art. 63 par. 1), infrasectional epithet treated as if new, Art. 72; typified by *C. comatus* fide Earle (1909).]

I do not consider the *Comati* of J. E. Lange (1915), as well as his other principal divisions of the genus (*Farinosi* and *Nudi*), to have definite rank. Lange calls them his "three main groups or tribes" in the introduction, but does not specify rank for them (or any other of his subdivisions) in the key and other descriptive portion. In the reiteration of his classification of *Coprinus* (Lange 1939), no mention at all is made of tribes.

Lectotypes are chosen for four of the names in synonymy, *Coprinus* section *Volvati*, the *Volvocoprinus* group, the *Annulati* of Quélet, and the first *Annulati* of Lange.

2. COPRINUS section ATRAMENTARII (Fr.) Penn. in Kauff. 1918:207, 212.

Type species: *C. atramentarius* (Bull. ex Fr.) Fr.

Coprinus tribe *Pelliculosti Atramentarii* Fr. 1838:243.
[Validly published name (*Coprinus Atramentarii*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. atramentarius*, Art. 22 par. 4.]

Coprinus sect. *Comati* subsect. *Atramentarii* (Fr.)
Sing. 1951:459. [Subsectional rank assigned by
Singer (1951) non Konrad & Maublanc (1930).]

Coprinus Coprinus Rick. 1910:62. [Invalid, Art. 22 par. 3.]

Coprinus Comati Exannulati J.Lange 1915:36 non J.Lange 1915:37 nec Karst. 1876. [Illegitimate name (*Coprinus Exannulati*), Art. 64 par. 2; species lectotypica: *C. atramentarius* (Bull. ex Fr.) Fr.]

Coprinus Comati Exannulati Subglabri J.Lange 1915:36.
[Validly published name (*Coprinus Subglabri*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. atramentarius* (Bull. ex Fr.) Fr.]

Coprinus atramentarius is designated lectotype species for *Coprinus* [group] *Subglabri*, and the first *Exannulati* of Lange.

3. COPRINUS section PICACEI (Fr.) Penn. in Kauff. 1918:207, 213.

Type species: *C. picaceus* (Bull. ex Fr.) S.F.Gray

Coprinus tribe *Pelliculosi Picacei* Fr. 1838:244.
[Validly published name (*Coprinus Picacei*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. picaceus*, Art. 22 par. 4.]

Coprinus Velocoprinus Rick. 1910:58. [Illegitimate, Art. 64 par. 2; species lectotypica: *C. picaceus* (Bull. ex Fr.) S.F.Gray.]

Coprinus Comati Exannulati Tomentosi Atrospori J.Lange 1915:36. [Validly published name (*Coprinus Atrospori*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. picaceus* (Bull. ex Fr.) S.F.Gray.]

Coprinus sect. *Impexi* Romag. 1947:80. [Invalid, Art. 32.]

Coprinus sect. *Quadrifidi* A.H.Sm. & Shaf. 1964:78.
[Invalid, Art. 32.]

Coprinus picaceus is selected as lectotype for both the *Velocoprinus* and *Atrospori* groups listed above. The former is a later homonym of Hennings' (in Engler & Prantl 1897) subgenus.

4. COPRINUS section HERBICOLAE Pil. & Svr. 1967:136.

Type species: *C. urticicola* (Berk. & Br.) Buller

Coprinus sect. *Coprinopsis* (Karst.) Pat. 1887:126.
[Invalid, Art. 32 & 21 par. 3.]

Coprinus Comati Exannulati Tomentosi Phaeospori J.Lange 1915:37. [Validly published name (*Coprinus Phaeospori*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. phaeosporus* Karst., Art. 22 par. 4.]

Coprinus sect. *Coprinus* subsect. *Alachuani* Sing. 1962a: 67. [Typified by *C. alachuanus* Murr. fide Singer (1962a).]

This rather recently recognized section in *Coprinus* is presently considered distinct from the preceding group, section *Picacei*.

5. COPRINUS section LANATULI (Fr.) Penn. in Kauff. 1918: 207,220.

Type species: *C. lagopus* (Fr.) Fr.

Coprinus tribe *Veliformes Lanatuli* Fr. 1838:250.
[Validly published name (*Coprinus Lanatuli*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. lagopus* fide Singer (1975).]

Coprinus sect. *Coprinus* subsect. *Lanatuli* (Fr.) Sing. 1975:494. [Invalid, Art. 33 par. 2.]

Coprinus tribe *Pelliculosi Tomentosi* Fr. 1838:245.
[Validly published name (*Coprinus Tomentosi*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. tomentosus* (Bull. ex Fr.) Fr., Art. 22 par. 4.]

Coprinus Pelliculosi sect. *Tomentosi* (Fr.) Penn. in Kauff. 1918:207,214.

Coprinus sect. *Veliformes Exannulati* Karst. 1876:157 non J.Lange 1915. [Validly published name (*Coprinus Exannulati*) without priority except for homonymy, Art. 35 (Leningrad Code); species lectotypica: *C. lagopus* (Fr.) Fr.]

Coprinus Pelliculosi Velati Quél. 1888:50. [Validly published name (*Coprinus Velati*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. velatus* Quél., Art. 22 par. 4.]

Coprinus sect. *Lagopodes* Romag. 1947:76. [Invalid, Art. 32.]

The *Tomentosi* and *Lanatuli* groups of Fries (1838) contain species which for the most part should be placed in the same section. This is more or less current practice (Singer 1975; Orton 1957; Kühner & Romagnesi 1953) with authors recognizing only the *Lanatuli* as a section or subsection.

Coprinus lagopus is the lectotype of the *Lanatuli* and is likewise chosen lectotype species for Karsten's *Ewannulati* group.

6. COPRINUS section INSIGNES Patrick, sect. nov.

Typus sectionis: *C. insignis* Peck

Sectio sporis anthracinis in deposito novo sicut in sicco; sub microscopio sporis plus minusve limoni-formibus et rostratis versus apicem truncatum, pariete incrassato et conspicue verrucoso ob grossos et irregulares projecturas.

Haec sectio interjacet duas sectiones laevisporas quae *Lanatuli* et *Picacei* appellantur. Structura veli saltem in specie typo indicat cognationem propinquiorem priori quam posteriori.

7. COPRINUS section VELIFORMES Fr. ex Cooke 1871:166 emend. Patrick

Type species: *C. stercoreus* Fr.

Coprinus tribe *Veliformes* Fr. 1838:250. [Invalid, Art. 33 par. 3.]

Coprinus tribe *Veliformes* *Cyclodes* ["*Cyclodei*"] Fr. 1838:250. [Validly published name (*Coprinus Cyclodes*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. cyclodes* [Mich.] Fr., Art. 22 par. 4.]

Coprinus Veliformes sect. *Cyclodes* ["*Cyclodei*"] (Fr.) Penn. in Kauff. 1918:207,220.

Coprinus sect. *Cyclodes* ["*Cyclodei*"] (Fr.) Sing. 1975:494. [Illegitimate, Art. 64 par. 1; typified

by *C. hendersonii* (Berk.) Fr. fide Singer (1975).]

Coprinus tribe *Veliformes* *Furfurelli* Fr. 1838:251.
[Validly published name (*Coprinus Furfurelli*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. stercoreus* Fr.]

Coprinus Veliformes sect. *Furfurelli* (Fr.) Penn.
in Kauff. 1918:207,223.

Coprinus sect. *Veliformes* *Annulati* Karst. 1876:157
non Quél 1888 nec J.Lange 1915. [Validly published name (*Coprinus Annulati*) without priority except for homonymy, Art. 35 (Leningrad Code); typified by *C. ephemeroides* (Bull. ex Fr.) Fr., ICBN Guide Det. Types, No. 1.]

Coprinus Farinosi *Annulati* J.Lange 1915:37 non J.Lange 1915:36 nec Karst. 1876 nec Quél. 1888.
[Illegitimate name (*Coprinus Annulati*), Art. 64 par. 2; typified by *C. ephemeroides*, ICBN Guide Det. Types No. 1.]

Coprinus Farinosi J.Lange 1915:37. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. niveus* (Pers. ex Fr.) Fr.]

Coprinus sect. *Farinosi* (J.Lange) Kon. & Maub.
1930:68.

Coprinus sect. *Vestiti* gr. *Farinosae* Locq. 1956:276.
[Invalid, Art. 32.]

Coprinus Farinosi *Exannulati* J.Lange 1915:37 non J. Lange 1915:36 nec Karst. 1876. [Illegitimate name (*Coprinus Exannulati*), Art. 64 par. 2; species lectotypica: *C. stercoreus* Fr. ("*stercorarius*" in Lange).]

Coprinus Farinosi *Exannulati* *Vestiti* J.Lange 1915:37.
[Validly published name (*Coprinus Vestiti*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. stercoreus* Fr. ("*stercorarius*" in Lange).]

Coprinus sect. *Vestiti* (J.Lange) Kühn & Romag. 1953:
383. [Invalid, Art. 33 par. 2.]

Coprinus sect. *Vestiti* gr. *Narcoticae* Locq. 1956:276.
[Invalid, Art. 32.]

Section *Veliformes* of Cooke (1871) contains the Friesian (1838) subunits *Cyclodei*, *Furfurelli*, *Lanatuli*, and *Hemerobii*. Together, these comprise an unnatural group for a section in *Coprinus*. Therefore, the *Veliformes* are restricted for the most part to the species of the closely related first two, and the *Lanatuli* and *Hemerobii* (sections exclusae) are treated separately elsewhere.

Coprinus stercoreus Fr. is hereby designated species lectotypica for *Coprinus* section *Veliformes*. Lectotypes are also selected for the names of the *Furfurelli*, *Farinosi*, and *Vestiti* groups, as well as the second *Exannulati* of Lange.

8. COPRINUS section MICACEI (Fr.) Penn. in Kauff. 1918: 207, 218.

Type species: *C. micaceus* (Bull. ex Fr.) Fr.

Coprinus tribe *Pelliculosi Micacei* Fr. 1838:247. [Validly published name (*Coprinus Micacei*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. micaceus*, Art. 22 par. 4.]

Coprinus sect. *Micacei* subsect. *Exannulati* Sing. 1951:460. [Subsectional epithet should be treated as if new, Art. 72; illegitimate, Art. 64 par. 2; typified by *C. micaceus* fide Singer (1951).]

9. COPRINUS section DOMESTICI (Singer) Patrick, stat. nov.

Type species: *C. domesticus* (Bolt. ex Fr.) S.F.Gray

Basionym: *Coprinus* subsect. *Domestici* Sing. 1948:36. [Typified by *C. domesticus* fide Singer (1948).]

Though closely related to section *Micacei*, this section is presently considered distinct. Interestingly, the type species, *C. domesticus*, comes from the *Furfurelli* of Fries (1838) rather than Fries' *Micacei* group.

10. COPRINUS section GLABRATI (Fr.) Penn. in Kauff. 1918:207.

Type species: *C. congregatus* (Bull. ex St.Amans) Fr.

Coprinus tribe *Pelliculosi Glabrati* Fr. 1838:248. [Validly published name (*Coprinus Glabrati*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. congregatus* (Bull. ex St.Amans) Fr.]

Coprinus Coprinellus Rick. 1911:65. [Validly published name without rank or priority, Art. 35 (Leningrad Code); typified by *C. disseminatus* (Pers. ex Fr.) S.F.Gray fide Donk (1962).]

Coprinus Nudi J.Lange 1915:38. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. ephemerus* (Bull. ex Fr.) Fr.]

Coprinus sect. *Nudi* (J.Lange) Kon. & Maub. 1930:70.

Coprinus subsect. *Nudi* (J.Lange) Sing. 1948:36.

Coprinus Nudi Setulosi J.Lange 1915:38. [Validly published name (*Coprinus Setulosi*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. ephemerus* fide M. Lange & A. H. Smith (1953).]

Coprinus sect. *Nudi* subsect. *Setulosi* (J.Lange) M. Lange 1952:12.

Coprinus sect. *Setulosi* (J.Lange) Kühn. & Romag. 1953:377. [Invalid, Art. 33 par. 2.]

Coprinus sect *Hemerobii* subsect. *Setulosi* (J.Lange) Sing. 1962b:502. [Illegitimate, Art. 64 par. 1; typified by *C. disseminatus* fide Singer (1962).]

Coprinus sect. *Salebrosi* Kühn & Romag. 1948:170. [Invalid, Art. 32.]

Coprinus sect. *Setulosi* gr. *Carbonicolae* Locq. 1956:276. [Invalid, Art. 32.]

Coprinus sect. *Setulosi* gr. *Disseminatae* Locq. 1956:276. [Invalid, Art. 32.]

Coprinus sect. *Setulosi* gr. *Ephemeræ* Locq. 1956:276. [Invalid, Art. 32.]

Coprinus sect. *Ephemerii* A.H.Sm. & Shaf. 1964:77. [Invalid, Art. 32.]

Coprinus sect. *Setulosi* gr. *Mixtae* Locq. 1956:276. [Invalid, Art. 32.]

Donk (1962 p. 72) may or may not be interpreted as having assigned rank to the *Coprinellus* group of Ricken (1911; non *Coprinellus* Karst. 1879). In my opinion, he probably did not. Instead, he may have considered the *Coprinellus* as already of subgeneric rank in Ricken. (See also "Velocoprinus", Donk l.c. p. 295.) This may be due to the fact that the names of two of Ricken's other unranked infrageneric groups (*Volvocoprinus* and *Velocoprinus*) previously were published as subgenera by Hennings (in Engler & Prantl 1897). Hennings had a subgenus *Eucoprinus* in addition to *Volvocoprinus* and *Velocoprinus*, but had no subgenus *Coprinellus*.

Coprinus congregatus is designated lectotype of *Coprinus* section *Glabrati*. In synonymy, a lectotype is also chosen for the *Nudi* group.

11. COPRINUS section HEMEROBII (Fr.) Penn. in Kauff. 1918: 207,224.

Type species: *C. hemerobius* Fr.

Coprinus tribe *Veliformes* *Hemerobii* Fr. 1838:253. [Validly published name (*Coprinus Hemerobii*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. hemerobius*, Art. 22 par. 4.]

Coprinus Nudi Glabri J.Lange 1915:38. [Validly published name (*Coprinus Glabri*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. plicatilis* (W.Curt. ex Fr.) Fr.]

Coprinus sect. *Hemerobii* subsect. *Glabri* (J.Lange) Sing. 1962b:502. [Invalid, Art. 33 par. 2.]

Coprinus sect. *Plicatiles* A.H.Sm. & Shaf. 1964:77. [Invalid, Art. 32.]

A lectotype species is selected for *Coprinus* [group] *Glabri*.

12. COPRINUS section AURICOMI (Singer) Patrick, stat. nov.

Type species: *C. auricomus* Pat.

Basionym: *Coprinus* subsect. *Auricomi* Sing. 1948:36. [Typified by *C. auricomus*, Art. 22 par. 4.]

Section *Auricomi* falls between the closely related section *Hemerobii* in *Coprinus*, and the *Subatratae* series (A. H. Smith 1972) in the genus *Psathyrella*.

TAXA SEDIS INCERTAE

Coprinus Veliformes Basipedes W.G.Sm. 1908:203. [Validly published name (*Coprinus Basipedes*) without rank or priority, Art. 35 (Leningrad Code); based on *C. platypus* Berk. sens. Cooke (1883).]

Coprinus sect. *Psathyrellopsis* Locq. 1955:20. [Typified by *C. heimii* Locq. fide Locquin (1955).]

Coprinus Pelliculosi Rigidi Pat. 1900:175. [Validly published name (*Coprinus Rigidi*) without rank or priority, Art. 35 (Leningrad Code); based on "*C. Barbeyi* Kalch., *C. involucratus* Dur. et Lév., etc."]

ACKNOWLEDGMENTS

The author wishes to thank Alexander H. Smith and Edward G. Voss of the University Herbarium at the University of Michigan and Kent H. McKnight of the National Fungus Collections at Beltsville for reading and making many helpful suggestions toward improvement of the manuscript. Dr. Voss was particularly helpful because of his expert understanding of the code. A portion of this paper is included in a doctoral dissertation being submitted to the Rackham School of Graduate Studies at Michigan. The participation of Peter B. Kaufman (Department of Botany) and Harrison L. Morton (School of Natural Resources) as committee members, in addition to Drs. Smith and Voss, is also appreciated. R. D. Fraser and H. D. Cameron of the University of Michigan kindly checked the résumé and latin diagnosis.

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MYCOTAXON

Vol. VI, No. 2, pp. 356-358

October-December 1977

NOTES ON HYPHOMYCETES. XXI. *SPORIDESMIUM CARRII* SP. NOV.

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ABSTRACT

Sporidesmium carrii Morgan-Jones, a new species, is described and illustrated from a collection made on twigs of *Buxus sempervirens* L. var. *suffruticosa* L. in Alabama.

INTRODUCTION

Material of a species of *Sporidesmium* Link ex Fr. sporulating abundantly in close proximity to colonies of *Helminthosporium velutinum* Link ex Ficin. and Schubert on dead twigs of *Buxus sempervirens* var. *suffruticosa* collected in Alabama has been determined to represent an undescribed taxon. A name is established for it herein.

TAXONOMIC PART

Sporidesmium carrii sp. nov. (Fig. 1).

Coloniae effusae, pilosae, atrae. Mycelium plerumque in substrato immersum, ex hyphis ramosis, septatis, subhyalinis vel pallide brunneis, levibus, 2 - 3 μ crassis compositum. Conidiophora macronemata, mononemata, singula vel fasciculata, recta vel curvata, simplicia, cylindrica, septata, laevia, brunnea, per usque ad 3 proliferationes successivas ampulliformes elongascentia, ex basibus interdum bulbois, 32 - 81 X 4 - 6 μ . Cellae conidiogenae monoblasticae, terminales. Conidia singula, recta vel curvata, obclavata, saepe rostrata, ad basim conico-tuncata, pallide brunnea, 8 - 16 septata, laevia, 50 - 120 - 9 x 10 μ .

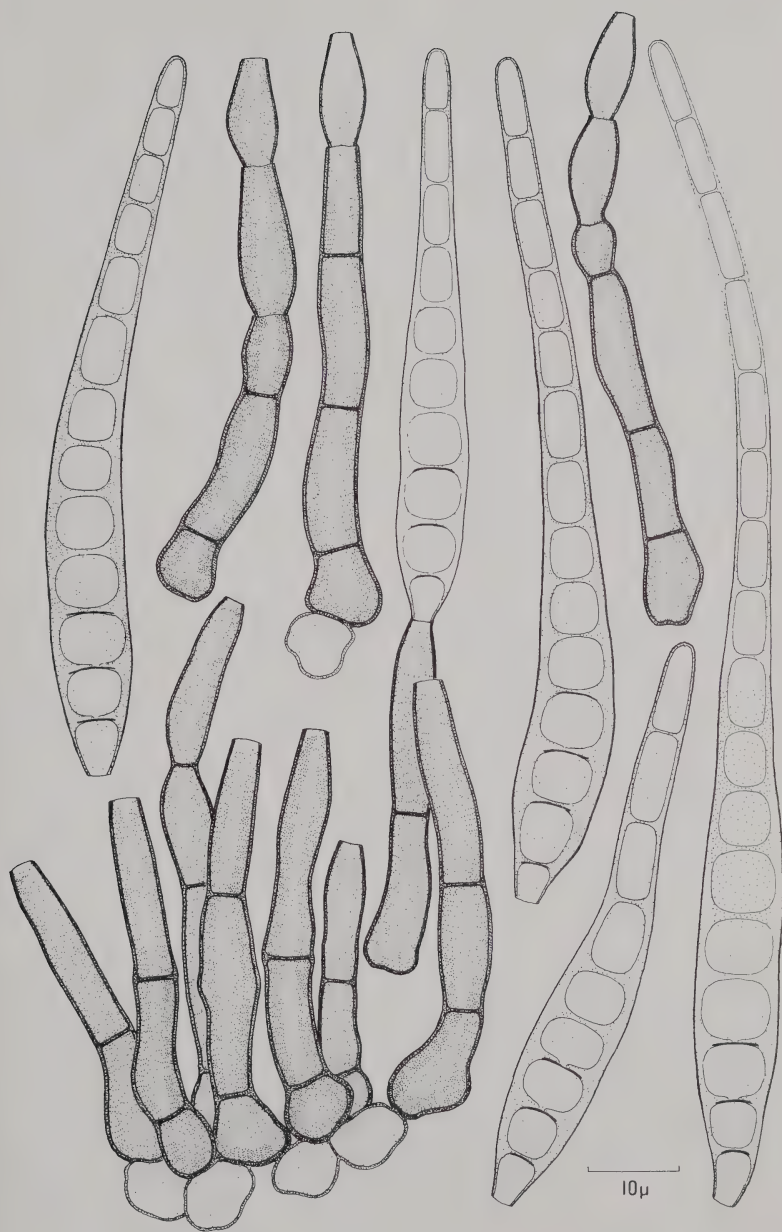


FIGURE 1. *Sporidesmium carrii*.

In ramulis emortuis *Buxi sempervirentis*, Auburn, Lee County, Alabama, March 1977, C.A. Carr, BPI, holotypus.

The new species is named in honor of Ms. Carolyn Ann Carr, its collector.

Colonies broadly effuse, hairy, black. Mycelium mostly immersed in the substratum, composed of branched, septate, subhyaline to pale brown, smooth, 2 - 3 μ wide hyphae; superficial hyphae giving rise to subglobose, pale brown, 5 - 6 μ wide cells, from which the conidiophores arise. Conidiophores macronematous, mononematous, gregarious or scattered, frequently aggregated in loose fascicles, straight or slightly flexuous, simple, smooth, brown, extreme apex paler, thick-walled, 1 to 3-septate, mostly 1-septate, cylindrical, sometimes proliferating percurrently two or three times, proliferations ampulliform, 32 - 81 X 4 - 6 μ , bulbous at the base and up to 8 μ wide, attenuating gradually towards the apex which is 3 - 4 μ wide. Conidiogenous cells integrated, terminal, monoblastic or producing up to three conidia by proliferation. Conidia solitary, single, straight or more usually curved, obclavate, often rostrate, base conico-truncate, pale brown, 8 to 16-septate, with a narrow dark band immediately above the lower three or four cells, 50 - 120 X 9 - 10 , 3 μ wide at the extreme base.

On dead twigs of *Buxus sempervirens* L.; North America.

Collection examined: on *B. sempervirens* var. *suffruticosa*, Auburn, Lee County, Alabama, March 1977, C.A. Carr, BPI, AUA, type.

The colonies of *S. carrii* sometimes overgrow those of *H. velutinum* and its superficial hyphae entwine old conidiophores of the latter. Numerous conidiophores are frequently produced in extended fascicles from these hyphae. When material collected from nature is incubated in moist chambers in the laboratory the conidia produced become increasingly rostrate.

S. carrii most closely resembles *S. ehrenbergii* M.B. Ellis, *S. eupatoricola* M.B. Ellis and *S. jasminicola* M.B. Ellis. It differs from them in conidium dimensions and pigmentation, sparser conidiophore septation as well as substrate. A fungus described by Matsushima (1975) and designated *Sporidesmium* sp. MFC-2075 appears to be closely similar to *S. carrii*. It might well be conspecific with it.

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MYCOTAXON

Vol. VI, No. 2, pp. 359-366

October-December 1977

THREE NEW ENDOGONACEAE: *GLOMUS CONSTRICTUS*, *SCLEROCYSTIS CLAVISPORA*, AND *ACAULOSPORA SCROBICULATA*

by

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In the course of collecting hypogeous fungi in Mexico, I sampled soils for Endogonaceae by the wet-sieving and decanting method (Gerdemann and Nicolson 1963). The three species described here were among the many found. Drs. G. Zentmyer and J. Menge of the University of California at Riverside subsequently found one of them, *Glomus constrictus*, in southern California orchards and provided specimens for examination. I then found another, *Acaulospora scrobiculata*, in the United States and Japan. Collections are deposited in the herbaria of Oregon State University (OSC), the Farlow Herbarium (FH), and Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional (ENCB).

SCLEROCYSTIS CLAVISPORA Trappe sp. nov.

Fig. 1

Sporocarpia globosa vel subglobosa, 460-750 x 590-780 μ m, fusca vel atra, minute verrucosa, e strato chlamydosporarum uno medullam e hyphis intertextam obducente constantia; peridium destitutum. Chlamydosporae brunneae, 140-185 x (20-) 25-40 (-50) μ m, clavatae vel subcylindricae, parietibus lateralibus 1.5-5 μ m, parietibus apicalibus 17-25 μ m, parietibus basalibus 5-8 μ m. TYPUS: Mexico, Veracruz, Trappe 3568 (OSC).

Sporocarps globose to subglobose, 460-750 x 590-780 μ m, brownish black to black, minutely verrucose from exposed tips of spores formed radially in a single, tightly packed layer

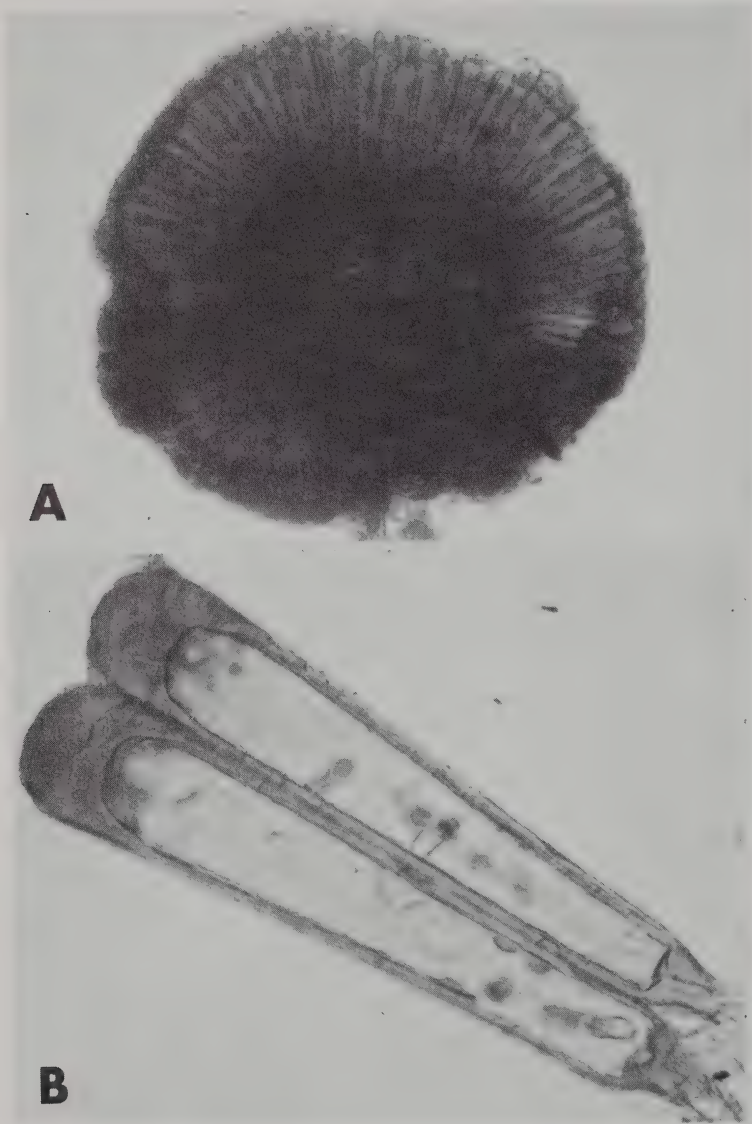


Fig. 1. *Sclerocystis clavispora*: (A) Sporocarps in cross-section, with long chlamydospores formed radially from central plexus, x100. (B) Chlamydospores, x500.

around a central plexus of hyphae; base indented; peridium lacking. *Chlamydosporae* brown 140-185 x (20-) 25-40 (-50) μm , clavate to subcylindric, tapering to a hyphal attachment 7-10 μm diam. Spore walls 1.5-5 μm thick on the sides, at the spore apex thickened to 17-25 μm , at the base thickened to 5-8 μm and occluding the attachment at maturity. Reaction to Melzer's reagent not distinctive. *Central plexus* 150-450 μm diam, of tightly interwoven, pale brown, thin-walled hyphae 3-10 μm diam.

DISTRIBUTION AND HABITAT: Tropical Mexico, in pastures and fields.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of grasses and *Saccharum officinarum* L.

ETYMOLOGY: Latin, *clavispora* (clavate spored).

COLLECTIONS EXAMINED: TYPE: MEXICO - Veracruz: 40 km south of Catemaco near Hueyapan among roots of grasses and forbs, 13 July 1972, Trappe 3568 (OSC, isotype ENCB).

PARATYPE: Oaxaca: Salinacruz, South of Jesús Carranza in grass field, 12 July 1972 (OSC).

Sclerocystis rubiformis Gerd. & Trappe is the only other species of the genus known to lack a peridium. The narrowly clavate spores with uniquely thickened apical walls of *S. clavispora* separate it readily from *S. rubiformis*. These spore characters can be used as an insertion for *S. clavispora* in couplet 1 of the key to species of *Sclerocystis* in Gerdemann and Trappe (1974, p. 60).

A species similar to *S. clavispora* has been reported from India by Thapar and Khan (1973), figs. 19-21, 30, 33) and Bakshi (1974, Pl. XII, figs. 17-19). These authors do not describe the pattern of spore wall thickening, however, and I have not seen their material. Its identity thus remains uncertain.

GLOMUS CONSTRICTUS Trappe sp. nov.

Fig. 2A.

Chlamydosporae subglobosae vel globosae, 150-330 μm diam, fuscae vel nigrae; parietibus fuscis, 7-12 (-15) μm crassis; basibus rectis vel infundibuliformibus. Hypha affixa recta vel recurvata, ad basim sporae 20-30 μm diam, prope sporam typice constricta ad 10-17 (-22) μm , sub constrictio typice tumida ad 15-30 μm et hyphis tenuibus protrudentibus, sub tumore dichotome furcata. Peridium destitutum. Typus: Mexico, Veracruz, Trappe 3574 (OSC).

Chlamydospores naked, formed singly or in loose clusters in soil, subglobose to globose, 150-330 μm diam, dark brown to black, shiny-smooth. Spore walls 7-12(-15) μm thick, dark brown, one-layered or occasionally seeming two-layered; base straight or occasionally with a short funnel-shaped projection attachment occluded by wall thickenings; contents of oil globules of widely varying sizes. Reaction to Melzer's reagent not distinctive. Attached hypha straight to recurved and with the following features appearing in sequence away from the spore: point of attachment with dark brown walls 3-6 μm thick; just beyond the point of attachment the hypha constricted to 10-17(-22) μm diam; just beyond the constriction the hypha inflated to 15-30 μm diam with yellow to yellow-brown walls 2-3 μm thick, from which often grow several hyaline to yellow, fragile, thin-walled hyphae 5-7 μm diam; just beyond the inflated segment often with a thick-walled septum; and beyond the inflated segment the hypha dichotomously forked.

DISTRIBUTION AND HABITAT: Central California in irrigate soils to Guadeloupe (Leeward Islands) and tropical rain forest of Mexico.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of *Cocos*, *Citrus*, and *Persea* spp., *Zea mays* L., and grasses.

ETYMOLOGY: Latin, "constricted," referring to the typical constriction of the attached hypha near the spore base.

COLLECTIONS EXAMINED. TYPE: MEXICO - Veracruz: San Andrés Tuxtla, Catemaco, in soil under *Cocos nucifera* L. on grounds of U.N.A.M. Biol. Sta. Headquarters, 9 July 1972, Trappe 3574 (OSC; isotype, ENCB). **PARATYPES:** UNITED STATES - California: Fresno Co., 13 Jan. 1976, leg. J. Menge, Trappe 4999 (OSC); Santa Barbara Co., Carpinteria, May 1974, leg. G. A. Zentmyer, Trappe 3920 (OSC); San Diego Co., Fallbrook, 8 April and May 1974, leg. G. A. Zentmyer, Trappe 3892 and 3915 (OSC). MEXICO - Hidalgo: Tulancingo, 4 Aug. 1972, Trappe 3829 (OSC, ENCB); Veracruz: Boca del Rio, 10 Sept. 1972, Trappe 3607 (OSC); Tabasco: Cardenas, 12 July 1972, Trappe 3589 (OSC); Chiapas: Ixtacomitán (camino Pichucalco-Chiapa de Corzo), 13 July 1972, Trappe 3791 (OSC). **GUADELOUPE** - Guadeloupe Nat. Forest, Camp Jacob, 7 Jan. 1974, leg. S. Carpenter and D. H. Pfister, Pfister 1060A (FH, OSC).

Glomus constrictus spores resemble those of *G. macrocarpum* var. *geosporus* (Nicol. & Gerd.) Gerd. & Trappe, but the distinctively, often recurved, constricted and then inflated attached hyphae of *G. constrictus* contrast with the straight,

simple attached hyphae of the other. The two sometimes occur together, so that in a field collection the base and attached hypha of each spore must be examined to separate them. However, *G. constrictus* typically has a cluster of soil particles held tightly to the spore base by the fine hyphae that usually grow out from the inflated part of its attached hypha. This provides a quick and reasonably reliable way to separate it from *G. macrocarpus* var. *geosporus*, which usually is clean at the spore base. Some spores of *G. constrictus* have a funnel-shaped base similar to that of *G. mosseae* (Nicol. & Gerd.) Gerd. & Trappe, but the latter has yellow to brown spores divided from the attached hyphae by a septum, and its spores are often enclosed in a peridium.

In the key to species of the genus *Glomus* (Gerdemann and Trappe 1974, p. 38-40), *G. constrictus* might key out in two different places. In dichotomy 3 it can be separated from *G. mosseae* by its dark brown to black color and constricted, then inflated attached hypha. In dichotomy 15, it can be separated from *G. macrocarpus* var. *geosporus* by the elaborate structure of its attached hypha.

The wall structure, lack of inner membranes or soil-borne vesicles, and content of variably sized oil globules of spores of *G. constrictus* are all typical of the genus *Glomus*. Its constricted and then inflated attached hypha, however, mimic the bulbous, suspensor-like cells at the base of spores of *Gigaspora* spp. (Gerdemann and Trappe 1974). In *Gigaspora heterogama* (Nicol. & Gerd.) Gerd. & Trappe, this suspensor-like cell is recurved as often is the attached hypha of *Glomus constrictus*. The dichotomous fork of the attached hypha a short distance below the base of *G. constrictus* spores resembles the conjugation of undifferentiated hyphae that produces a stalked zygospore in the genus *Dispora* (Dimargaritaceae, Mucorales) (Benjamin 1959, 1961). These features of *G. constrictus* may be merely coincidental, but its life cycle needs to be worked out to determine if it represents any phylogenetic ties between *Glomus*, *Gigaspora*, the zygosporic genus *Endogone*, or the Mucorales.

ACAULOSPORA SCROBICULATA Trappe sp. nov.

Figs. 2B-2C

Sporae singulae in solo efformatae, sessiles, gestae a latere hyphae latae in vesiculo globoso prope terminatae. Sporae globosae vel subglobosae, 100-240 x 100-220 μ m, olivaceae vel brunneolae, depressionibus 1-1.5 x 1-3 μ m scrobiculatae.

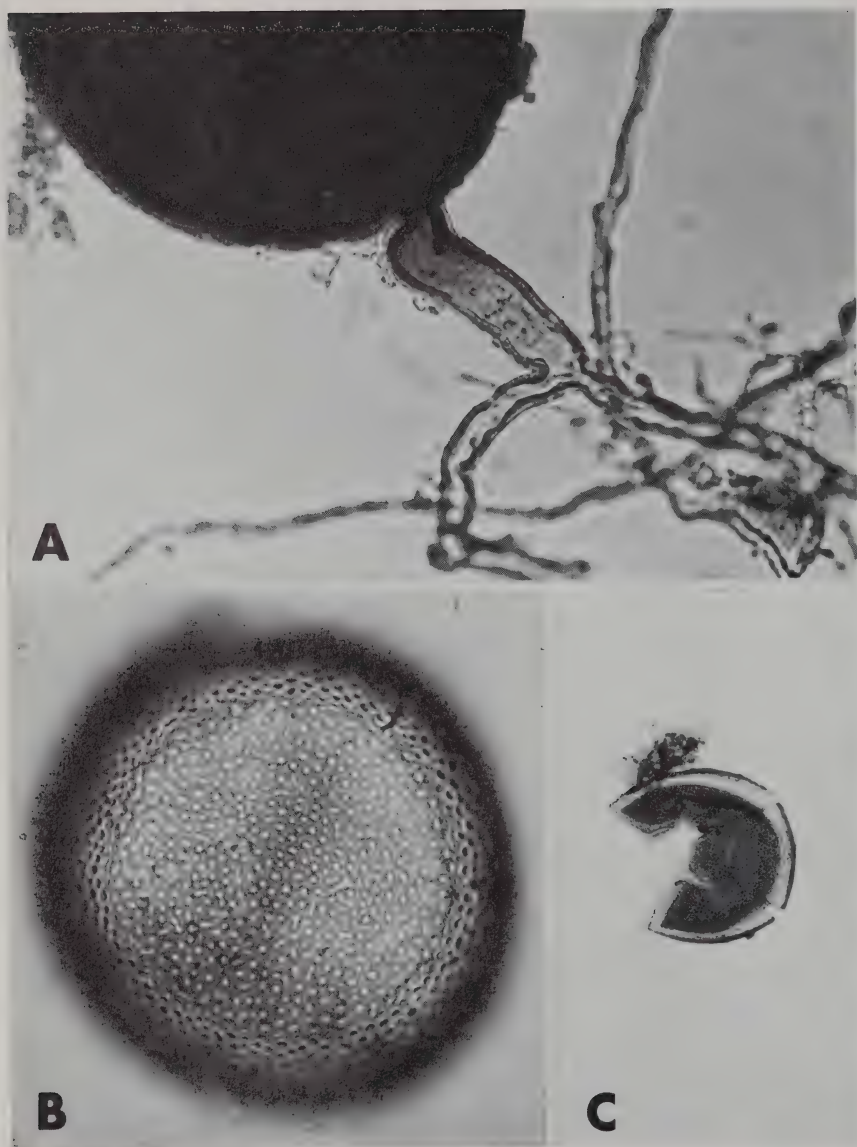


Fig. 2. (A) *Glomus constrictus*, showing constriction of hypha at attachment to spore, x350. (B,C) *Acaulospora scrobiculata*: (B) Pitted spore surface, x400; (C) crushed spore in Melzer's reagent, with innermost wall layer darkened, x 100.

Sporae tunica stratis quatuor: exteriore scrobiculato, dilute primulino, 3-6 μm crasso; secundo adhaerenti, hyalino, 0.2-0.5 μm crasso; tertio adhaerenti, hyalino, 0.5-1 μm crasso; interiore disjuncto, hyalino, interdum minute asperulo, 0.2-1.0 μm crasso, iodo rubescenti. Typus: Mexico, Chiapas, Trappe 3795 (OSC).

Sporocarps unknown. *Azygospores* forming singly in soil, sessile, borne laterally on a wide, thin-walled, hyaline hypha that terminates nearby in a thin-walled vesicle. *Vesicle* globose, 100-160 μm in diam, becoming empty and collapsing by spore maturity. *Spores* globose to broadly ellipsoid, 100-240 x 100-220 μm subhyaline in youth, becoming light olive to light brown at maturity. Spore surface evenly pitted with depressions 1-1.5 x 1-3 μm , separated by ridges 2-4 μm thick, the mouths of the depressions circular to elliptical or occasionally linear to Y-shaped. Spore wall continuous except at the circular, rimmed vesicle attachment ± 15 μm diam and consisting of four layers: (1) the rigid, pitted, subhyaline to light greenish yellow outer layer 3-6 μm thick; (2) an adhering but separable, smooth, hyaline layer 0.2-0.5 μm thick; (3) an adhering but separable, smooth, hyaline layer 0.5-1.0 μm thick; and (4) a separated, sometimes minutely roughened, hyaline inner layer 0.2-1.0 μm thick. Spore contents of small, relatively uniform guttules. Reactions to Melzer's reagent: outer three spore wall layers yellow, innermost layer quickly becoming deep red on contact.

DISTRIBUTION AND HABITAT: Rain forests, road banks, and sugarcane fields of the Mexican tropics and central highlands, maize fields and subalpine meadows of central and western USA, and lowlands of central Japan. Koske (1974) has described a "yellow punctate" spore from Australian sand dunes that fits the description of *A. scrobiculata*.

MYCORRHIZAL ASSOCIATIONS: Associated in Mexico with roots of *Saccharum officinarum* L. and wild grasses, in the U.S. with *Zea mays* L. and *Festuca viridula* Vasey, and in Japan with wild grasses.

ETYMOLOGY: Latin, "minutely pitted," referring to the spore surface.

COLLECTIONS EXAMINED: TYPE: MEXICO - Chiapas: Ixtacomitán (Camino Pichucalco-Chiapa de Corzo), 13 July 1972, Trappe 3795 (OSC; isotype, ENCB). PARATYPES: UNITED STATES - Washington: Columbia Co., Oregon Butte, 20 Aug. 1975, leg. Paul Tresham, Trappe 4538 (OSC). Oregon: Union Co., Indian Creek Meadow, 14 Aug. 1975, leg. Gerald Strickler, Trappe 4537 (OSC); Wallowa Co., Wallowa Mountains, Standley Pasture,

15 July 1975, leg. Gerald Strickler, Trappe 4494 (OSC).
Illinois: Mason Co., Kilbourne, 4 Oct. 1976, leg. Wm.
 Becker, Trappe 4998 (OSC). MEXICO - Mexico: 5 km E. of
 Toluca, 23 June 1972, Trappe 3861 (OSC). Veracruz: 5 km
 NE of Orizaba, 7 July 1972, Trappe 3604 (OSC). JAPAN -
Shiga: Ōtsu, Tomi-kawa, 3 July 1975, Trappe 4265 (OSC).

The red reaction of the innermost spore wall layer in Melzer's reagent is unique to *A. scrobiculata* among the Endogonaceae described to date. This reaction combined with the light colored, pitted spore wall readily distinguish *A. scrobiculata* from other *Acaulospora* spp. as described by Gerdemann and Trappe (1974) and Ames and Linderman (1976).

ACKNOWLEDGMENTS

Dr. Gastón Guzmán, Instituto Politécnico Nacional, E.N.C.B., Mexico, Dr. Teóphilo Herrera, Universidad Nacional Autónoma de México, and Dr. Tsuguo Hongo, Shiga University Faculty of Education, Japan, generously hosted the author in forays in their respective countries. The photographs of *G. constrictus* were provided by Dr. John Menge, University of California, Riverside. The research was supported in part by grants from the American Philosophical Society and the Japan Society for the Promotion of Science.

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MYCOTAXON

Vol. VI, No. 2, pp. 367-369

October-December 1977

WANGIELLA DERMATITIDIS, A CORRECTION

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Recently, *Wangiella* McGinnis was established to accommodate the dematiaceous hyphomycete originally described as *Hormiscium dermatitidis* Kano (3). Kano's 1937 description of the fungus did not include a Latin diagnosis; hence, the fungus was redescribed as a new species. It has been brought to my attention that Kano described this hyphomycete as a new species twice, once in 1934 (1) and again in 1937 (2). The binomial was validly published and does not contravene Article 36 as previously believed. Therefore, the revised authorship (Kano) McGinnis is proposed. Since Kano's isolate (CBS 207.35) has been designated as the type culture for both *W. dermatitidis* McGinnis and *W. dermatitidis* (Kano) McGinnis, these binomials are obligate synonyms.

Wangiella dermatitidis (Kano) McGinnis (Fig. 1).

- ≡ *Hormiscium dermatitidis* Kano, Aichi Igakkai Zasshi 41:1657-1673, 1934.
- ≡ *Fonsecaea dermatitidis* (Kano) Carrión, Arch. Dermatol. Syph. (Chicago) 61:996-1008, 1950.
- ≡ *Hormodendrum dermatitidis* (Kano) Conant, Manual of Clinical Mycology, p. 276, 1954 (as 1953).
- ≡ *Phialophora dermatitidis* (Kano) Emmons, Medical Mycology, p. 291, 1963.
- ≡ *Wangiella dermatitidis* McGinnis, Mycotaxon 5:355, 1977 (incorrect authorship).
- ≡ *Exophiala dermatitidis* (Kano) de Hoog, Mycol. Stud. Baarn, No. 15, p. 118, 1977.

Aureobasidium mansonii (Castellani) Cooke sensu Cooke, Mycopathol. Mycol. Appl. 17:34, 1962, pro parte, non *Microsporium mansonii* (as *Microsporon mansonii*) Castellani, Brit. Med. J. 2:1271, 1905, nom. dub.

Phialophora gougerotii (Matruchot) Borelli sensu Borelli, Mem. del VI. Con. Venez. Cient. Med. 5: 2945-2972, 1955, pro parte, non *Sporotrichum gougerotii* (as *gougeroti*) Matruchot, Compt. Rend. Acad. Sci. (Paris) 150:543-545, 1910.

Rhinocladiella mansonii (Castellani) Schol-Schwarz sensu Schol-Schwarz, Antonie van Leeuwenhoek 34: 122, 1968, pro parte, non *Microsporium mansonii* (as *Microsporon mansonii*) Castellani, Brit. Med. J. 2: 1271, 1905, nom. nud.

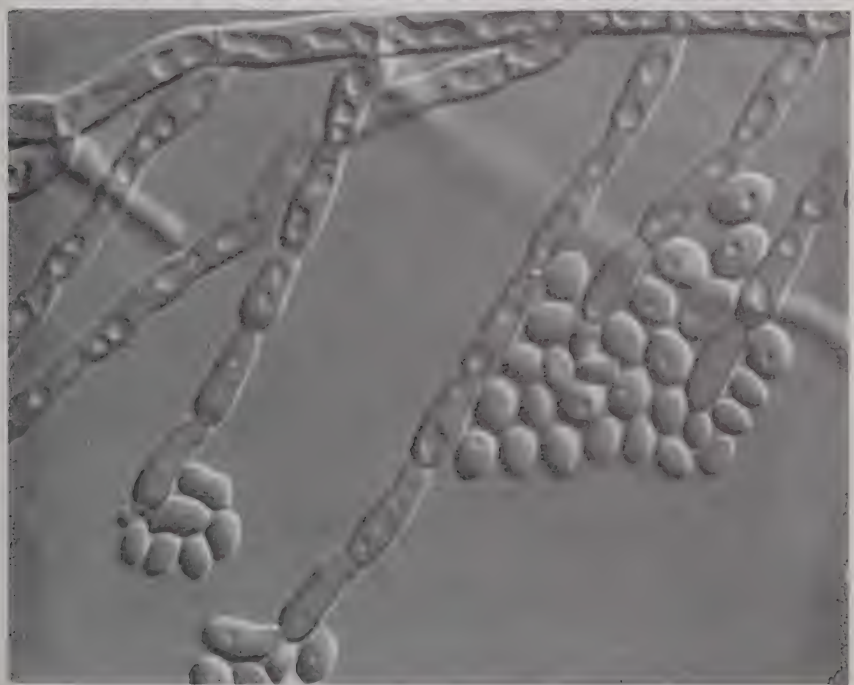
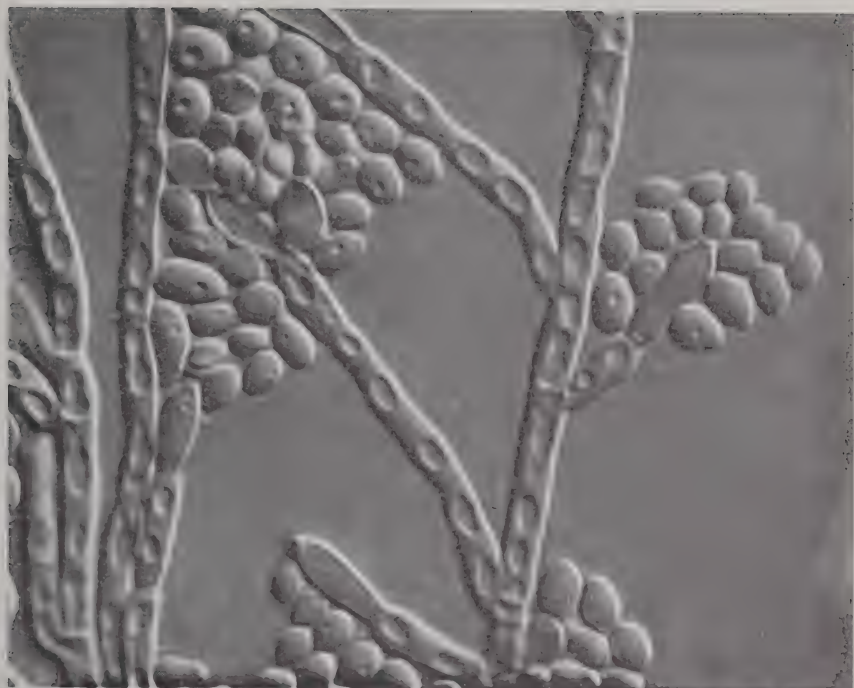
ACKNOWLEDGEMENTS

The author wishes to thank Dr. Donald Rogers for reviewing the manuscript and Mr. Barry Katz for photographic assistance.

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3. McGinnis, M.R. 1977. *Wangiella*, a new genus to accommodate *Hormiscium dermatitidis*. Mycotaxon 5:353-363.

Figure 1. *Wangiella dermatitidis* (CBS 207.35). Phialides and phialoconidia. Nomarski differential interference contrast microscopy. 1600 x.



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NOTICE

SOME ADDITIONAL SUGGESTIONS FOR MYCOTAXON AUTHORS

The Co-Editors of MYCOTAXON call to the attention of prospective authors various ways in which space can be saved in preparing manuscripts. These are in addition to the general Instructions in MYCOTAXON 1: 3-12. 1974.

1) AVOID DOUBLE SPACING UNLESS ABSOLUTELY NECESSARY. Double spacing between paragraphs is seldom required, but between sections of a paper may be useful. AVOID double spacing between references cited!

2) PLAN YOUR ILLUSTRATIONS BEFORE FINAL TYPING. Illustrations and legends that do not use the full page height should carry some text material on the same page, even if only a few lines. Plan carefully with your typist on positioning the illustration and legend in relation to text. If the illustration is narrow, can you run text alongside it?

3) CAN SOME MATERIAL BE PRESENTED AS EFFECTIVELY IN SMALLER TYPEFACE? Typical applications are references cited, Latin diagnoses, summary. Two simple methods of producing two sizes of typeface are:

a) Type the main text on a Pica typewriter using the Pica-size rectangle, and switch to an Elite typewriter on the same Pica-size rectangle for material you want in smaller typeface. (An example: MYCOTAXON 5: 518. 1977.)

b) Type the main text on an Elite typewriter using the Elite-size rectangle. Type those materials designed for smaller typeface also on the Elite typewriter, but use a Pica-size rectangle. Since the two will reduce different amounts, you will need to make a simple calculation to determine how much space to leave in your text for the reduced material. Approximately 6/5 as much Pica height can be used as Elite. For example, if you have 10 cm left at the bottom of your Elite rectangle for the references typed on a Pica rectangle, you can accommodate 12 cm of the Pica-rectangle copy at the base of that page. (An example: MYCOTAXON 3: 171-172. 1975.)

4) CAN REFERENCES CITED BE CONDENSED? We do not desire authors to reduce the bibliographic material needed for locating references. But instead of giving each reference its own new line, consider the possibility of running references on in paragraph style. (Examples of this procedure are seen in MYCOTAXON 5: 514. 1977, where this technique was combined with typeface reduction as in 3-a above, and in MYCOTAXON 5: 516. 1977, where this technique was combined with typeface reduction as in 3-b above.)

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MYCOTAXON

Vol. VI, No. 2, pp. 371-374

October-Décember 1977

A NEW TREMELLA WITH DECIDUOUS STERIGMATA

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Tremella mayorgae Lowy, sp. nov.

Figs. A-B

Fructificatio in humido elastico gelatinosa, rufo-brunnea, lobata magna (± 1 cm alt.), surrotunda, lacunosa; magnitudine in sicco valde contractio, atrofusca; hymenio cum basidia conferta; hyphae 3-4 μ m diam, parce nodosae; dikaryoparaphyseae non ramosae, longuisculae subclavatae, 22-27 X 3-4 μ m; probasidia subglobosa; metabasidia subovoidea, cruciatim septata, 23-26 (-30) X 8.5-10.5 (-12) μ m; protosterigmata cylindratae, transeuns fusiforme, 22-30.5 (-36) X 5.0-7.5 μ m, decidua quando matura; spiculae aciculae, 6.0-7.5 μ m long; basidiosporae subglobosae, (7-)8.0-9.5 μ m, per repetitionem vel promycelium germinantes.

Holotype: Mexico. Laguna al Campamento Uxpanaapa, Dpto. Veracruz. On unidentified woody substrate, 15-VII-1976. G. Guzmán No. 15833, Herbario de La Escuela Nacional de Ciencias Biológicas (ENCB).

Fructification rubbery gelatinous when wet, resin brown with large, rounded, hollow lobes ± 1 cm in height and ± 275 μ m thick; drying dark brown to nearly black, greatly reduced in volume; hymenium crowded with basidia; hyphae 3-4 μ m diam, sparsely clamped; dikaryoparaphyses unbranched, slenderly subclavate, 22-27 X 3-4 μ m; probasidia subspherical, becoming elongate; metabasidia 4-celled, subovoid, 23-26 (-30) X 8.5-10.5(-12) μ m; protosterigmata cylindrical, becoming subcylindrical and eventually fusiform, 22-30.5(-36) X 5.0-7.5 μ m in greatest diameter, deciduous when mature, with acicular spicules bearing subspherical basidiospores, (7-) 8.0-9.5 μ m, germinating by germ tube or by repetition.

This species is named in honor of the late, eminent

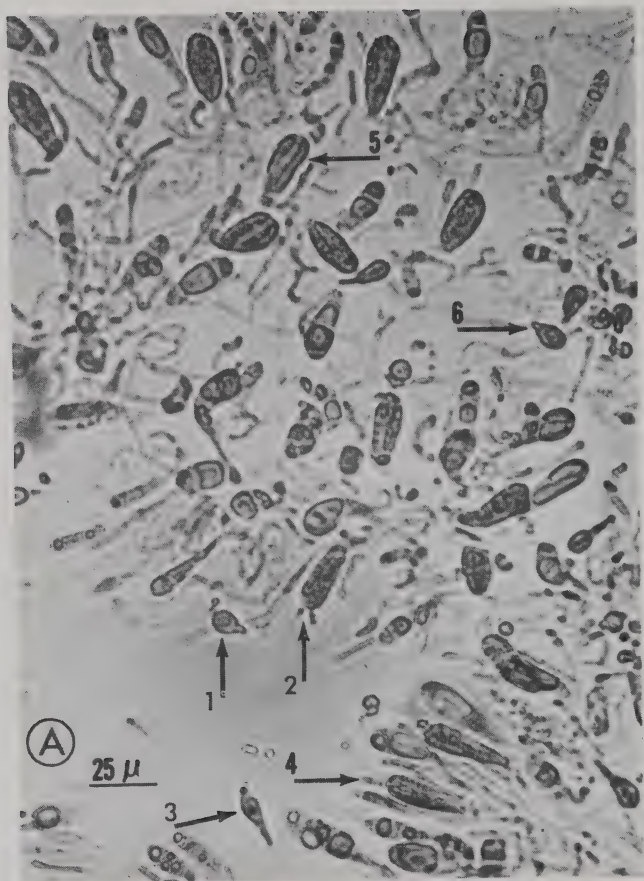


Fig. A. Crush mount of *Tremella mayorgae* Lowy. 1 & 6, basidiospores germinating by germ tube; 2 & 4, basidia with young, cylindrical protosterigmata; 3, detached fusiform sterigma. The spicule has not yet been produced at the apex (above); 5, a longitudinally septate metabasidium.

medical mycologist, Dr. Rubén Mayorga Peralta of the Universidad de San Carlos de Guatemala, where he pioneered in Guatemalan mycological studies.

The most notable feature of the new species is the

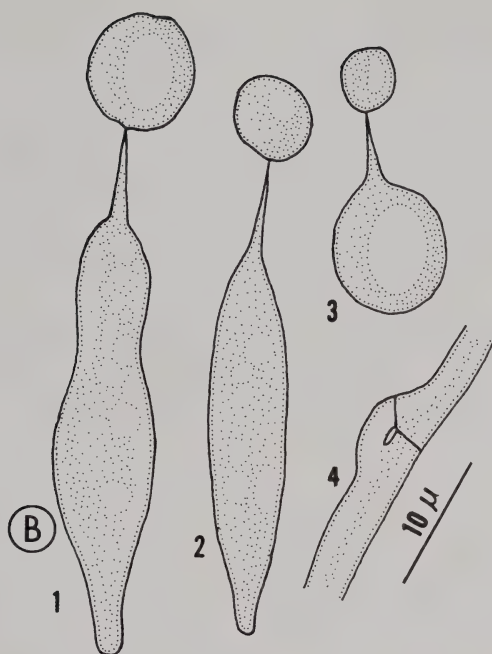


Fig. B. 1, mature sterigma with basidiospores borne upon its spicule; 2, maturing sterigma with young basidiospore; 3, basidiospore germinating by repetition; 4, hypha with clamp connection.

formation of sterigmata that eventually become detached from the basidium. Roughly three stages may be identified in the maturation of sterigmata. The first is characterized by the production of slender, cylindrical evaginations from the basidial apex (Fig. A, 2 & 4). These structures elongate, become broadly cylindrical and terminate in an acicular spicule (Fig. B, 2). At or near this stage, basidiospore formation is initiated and during the process the sterigma undergoes its final morphological change, becoming fusiform (Fig. B, 1). Fig. A, 3 shows a detached fusiform sterigma upon which the spicule has not yet formed. It is approximately intermediate between stages 1 & 2 shown in Fig. B. Sterigmata such as those in Fig. B, 1 & 2, were

found in crush mounts, but all those observed at these stages of development were detached from basidia. The precise stage of development that is reached by the sterigma prior to its detachment from the basidium, could not be determined. In all likelihood, detachment occurs after the basidiospore has been formed and while there is still continuity between the basidial cell and its emergent sterigma. The change in sterigmal shape is probably associated with the formation of the basidiospore as sterigmal cytoplasm flows through the spicule.

Only one other species of *Tremella*, *T. brasiliensis* (A. Möller) Lloyd, is known to produce sterigmata that become deciduous. In this species, however, the sterigmata remain unchanged in morphology (Lowy, 1971).

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MYCOTAXON

Vol. VI, No. 2, pp. 375-380

October-December 1977

NEW TAXA IN THE CORTICIACEAE
(APHYLLOPHORALES, BASIDIOMYCETES).

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SUMMARY

Physodontia, Physodontia lundelli and Sistotrema autumnalis are described as new based on collections from Scandinavia. The combination Sistotrema eximum (Jacks.) Ryv. & Solheim is proposed.

PHYSODONTIA Ryv. & Solheim gen. nov.

Fructificatio resupinata, grandinioidea vel aculeata, poroso-reticulata inter aculeos, alba vel pallide crenea, systema hypharum monomiticum, hyphae tenuiter tunicatae, fibulatae; gloeocystidia flava, abundantia cum in hymenio tum in subhymenio et tramati, cystidia in hymenio, anguste sublatae, laevia, hyalina, tenuitunicata proicientia, basidia pusilla, clavata, 4 sterigmatibus, sporae subgloboseae, laeves, pusillae, non-amyloideae.

Type species: Physodontia lundelli Ryv. & Solheim.

Fruitbody resupinate, grandinoid, odontoid to hydroid, porose-reticulate between the aculei, white to pale cream, hyphal system monomitic, hyphae with clamps, thinwalled, gloeocystidia ellipsoid to oblong, very numerous in the hymenium, subhymenium and trama, cystidia in the hymenium subulate, smooth, hyaline, thinwalled and projecting, basidia small, clavate with 4 sterigmata, spores small, subglobose, smooth and non-amyloid. On dead wood.

The small, smooth spores, the loose consistency, the ampullate swellings on the basal hyphae and the small basidia all point towards Trechispora as the closest relative. However, gloeocystidia are not known from this genus, and the cystidia described in Trechispora are of a different type than those of Physodontia. Thus, we

felt that we would introduce a far too deviating element if the new species had been described in Trechispora.

Gloeocystidia are known from many genera in the Corticiaceae, above all from Gloeocystidiellum, but this genus is characterized by amyloid spores and much larger basidia and spores besides which the hymenium is much denser. In conclusion, we felt that the new species had so many distinct characters in combination that a new genus was justified.

PHYSODONTIA LUNDELLI Ryv. & Solheim nov. sp.

Fructificatio resupinata, grandinioidea vel aculeata, poroso-reticulata inter aculeos, alba vel pallide crenea, systema hypharum monomiticum; hyphae tenuitunicatae, fibulatae; gloeocystidia flava abundantia cum in hymenio, tum in subhymenio et tramati, 12-20 x 6-12 μ m, cystidia in hymenio, 18-40 x 3-5 μ m, anguste sublata, laevia, flavida, hyalina, basidia 8-15 x 4-5,5 pusilla, clavata, 4 sterigmatibus; sporae subglobosae, laeves, pusillae, non-amyloideae, 3-3,5 x 2-2,5 μ m.

Type Lundell 1667, (Herb. U. O. Eriksson).

Type locality: Sweden: Småland, Femsjö parish, Dullabergets northern slope, 4. Oct. 1939, on rotten coniferous wood.

Fruitbody resupinate, grandinoid to hydroid, aculei up to 300 μ m long, finely fimbriate in the apices, white to pale cream, hyphal system monomitic, generative hyphae with clamps, 2-4 μ m wide, thinwalled, gloeocystidia very abundant, yellowish and with a grainy content, oblong to rounded, 12-20 x 6-12 μ m, present in the hymenium, subhymenium and the trama of central part of the teeth, cystidia present in the hymenium, thinwalled, subulate, hyaline, acute, projecting above the hymenium, 18-40 x 3-5 μ m, basidia small, clavate 8-15 x 4-5,5 μ m with 4 sterigmata, spores subglobose, thinwalled, hyaline and smooth non-amyloid, 3-3,5 x 2-2,5 μ m,

Other specimens seen:

Sweden: Västergötland, Mölndal, Änggårdssbergen, 3. Nov. 1971, S. Jacobsen 9821, on coniferous wood (Herb. E.); Norway: Hedmark, Engerdal, Røskdalsknappen, 900 m a.s.l., 19. August 1975, H. Solheim 354 (Herb. O and Erikss.); Finland: Ostrobotnia, Rovaniemi, Pisvaara nat. park between Isopäri and Teeripäri, 1. Sept. 1960, V. Kujala and J. Eriksson 9821, on rotten Pinus sylvestris (Herb. Eriksson).

The species is named in honour of the late curator S. Lundell of the Uppsala herbarium who made the first collection of the species. His note, enclosed in the type specimen, indicates that he was aware of its unique combination of characters and that it probably was

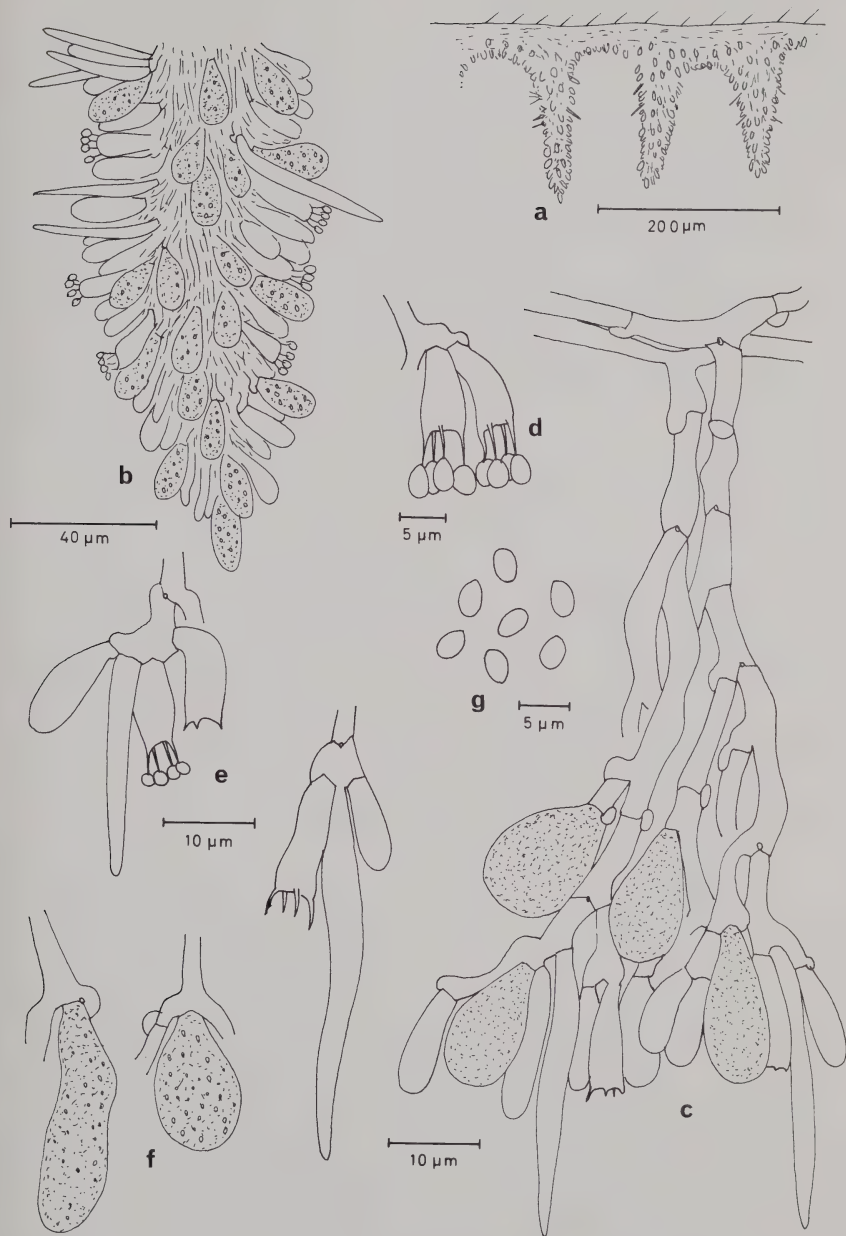


Fig.1. *Physodontia lundelli*. a) section through the fruit-body b) section through an aculeus c) section through the hymenium d) basidia e) basidia and cystidia f) gloeocystidia g) spores. From the type. Drawing by L. Ryvarden.

undescribed. We guess that the species will be found in USSR and perhaps also in North America. Its known distribution indicates a boreal species.

SISTOTREMA AUTUMNALIS Ryvarden & Solheim nov.sp.

Fructificatio resupinata, tenuis, arachnoidea, porosereticulata, deinde subpellicularis, albida, usque ad 100 μ m crassa; hyphae fibulatae; basidia longe urniformia, 30-50 x 5-7- μ m, 2 sterigmatibus, usque ad 7 longis, sporae oblonge ellipsoideae ad fusiformes, 10-14(16) x 5,5-8 μ m. Typus: Bjørgum 1298 (Herb. O, DAOM and Eriksson). Type locality: Norway, Nordland county, Tjeldsund, Kongsvikdalen, 28. September 1967, on Alnus incana. Fruitbody white, resupinate, first thin, arachnoid, porosereticulate, then subpellicular, up to 100 μ m thick, generative hyphae thinwalled, clamped with oily drops, those of the subiculum up to 6 μ m wide and some clamps with ampullate-shaped swellings, basidia elongate, urniform to suburniform, 30-50 x 5-7 μ m with two stout and curved sterigmata up to 7 μ m long, spores thinwalled, hyaline and non-amyloid, ellipsoid to fusiform, 10-14(16) x 5,5-8 μ m, on rotten deciduous wood. Specimens seen, all from Norway; Nordland county, Tjeldsund, Kongsvikdalen, 28. September 1976, on Betula, Alnus incana and Salix, leg. K. Bjørgum 1258, 1266, 1296 and 1298. Lødingen, Kanstadfjorden, 16. September 1976, on Betula, K. Bjørgum 1110, ibid. 5. October 1976 on Alnus incana, K. Bjørgum 1574. Hedmark county, Engerdal, Røskdalsknappen, 9. October 1976, on Betula and Sorbus, Solheim 2212a, 2173a and 2174. Engerdal, Gutulia national park, 10. October 1976, on Alnus incana, Betula and Sorbus, Solheim 2229, 2233 and 2265. All in herb. O.

It is extraordinary that a species with so many striking characters should be undescribed. However, we have searched the literature in vain and J. Eriksson of the University of Göteborg who kindly examined the collections is convinced that it is new. Further, it is remarkable that 12 collections should turn up in a single season even if some of them are taken rather close to each other. Solheim's collections are taken in the most strongly continental part of Norway with dry and hot summers and very cold winters (frequently down to -40°C). Those of Bjørgum are collected some 1500 km further to the north in a typical oceanic coastal area with humid summers and mild winters. Thus, the new species must have a very wide climatical amplitude.

As reflected in the specific name, all collections have been made rather late in the season in a mild period after the first frost. This may be significant and could indicate that the species is psychrofilous. It may also explain why it has been overlooked for so many years as corticiologists in general are not too keen to go

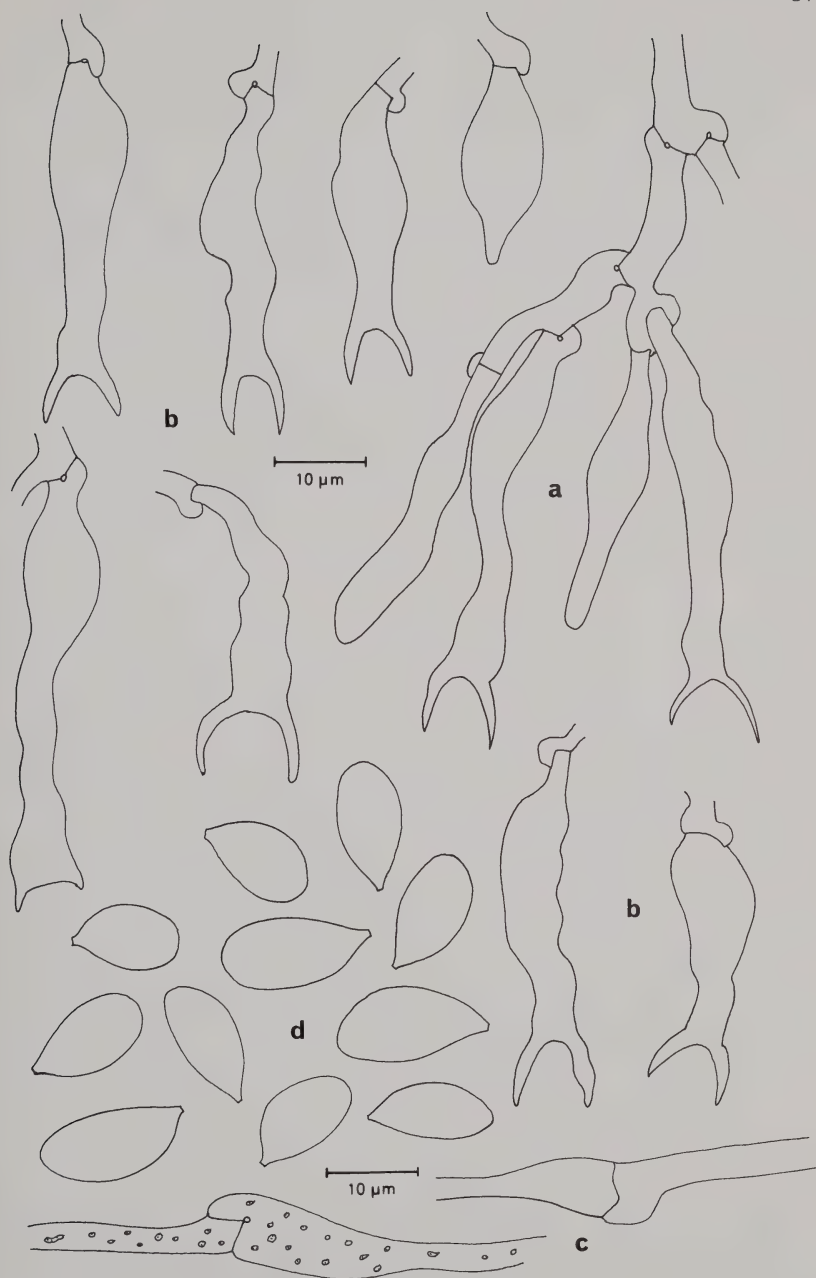


Fig.2. *Sistotrema autumnalis*. a) part of the hymenium b) basidia in different stages of development c) basal hyphae with swellings d) spores. From the type. Drawing by L. Ryvarden.

collecting when the temperature comes close the freezing point. The reason why both Bjørgum and Solheim did it, is that they had been instructed to collect until the snow covered the ground.

It is with a certain doubt that the new species is placed in Sistotrema and not in Urnobasidium, which could have been an alternative. Urnobasidium is typified by U. sernanderi, which has gloeocystidia and urniform basidia with 2-4 sterigmata.

Except for these characters, the genera come very close to each other and the need of Urnobasidium as a genus of its own may be discussed. As our new species differs considerably from the type of Urnobasidium, we have chosen to refer it to Sistotrema. A third character that points towards Sistotrema are the ampullate swellings found in connections with clamps on many of the hyphae in the subiculum. This is also a common feature in Sistotrema. The same is true for the many oily drops and irregular bodies in the hyphal protoplasm.

K. Hjortstam, K.H. Larsson and J. Eriksson have all seen our specimens and we came all to the conclusion that Sistotrema was the best genus. A more detailed discussion on Sistotrema and its delimitation will be given in a later volume of Corticiaceae of North Europe.

Corticium eximum Jacks. is undoubtedly closely related. By courtesy of Fr. J. Eriksson who had the type material on loan, we had the opportunity to study the type in Göteborg. The main character separating the new species is the shape of the spores which are broadly ellipsoid and 8-10,5 long in C. eximum, subfusiform and 10-14 μ m long in S. autumnalis. The number of sterigmata in C. eximum varies from 2 to 4 even if 2 is the dominating number. The basidia of S. autumnalis have persistently only two sterigmata. The form of the basidia is the same in both species, and the following new combination is proposed: Sistotrema eximum (Jacks.) Ryv. & Solheim comb. nov. Basionym: Corticium eximum Jacks. Can. J. Res. 26, Sec. C:152, 1948

ACKNOWLEDGEMENTS

We are most grateful to John Eriksson for his generosity in placing collections of Physodontia at our disposal and who also proposed the new name to us. Further, he, Kurt Hjortstam and Karl-Henrik Larsson have all been helpful with suggestions in connection with Sistotrema autumnalis for which we extend our most sincere thanks.

MYCOTAXON

Vol. VI, No. 2, pp. 381-390

October-December 1977

ENTOMOPHTHORA TURBINATA SP. N., A FUNGAL PARASITE OF THE PEACH TRUNK APHID, PTEROCHLOROIDES PERSICAE (LACHNIDAE)

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SUMMARY

Entomophthora turbinata sp. nov., attacking the peach trunk aphid, *Pterochloroides persicae*, was identified. Infected aphids were found only in late spring on the coastal plain of Israel. Turbinate conidia containing 5-7 nuclei and internal black resting spores, similar to those of *E. fresenii*, were not found to occur simultaneously within the same individual. Neither secondary conidia, rhizoids, nor cystidia were observed. Diseased aphids tended to hang by their rostra and those with resting spores assumed the form of a drop of fluid. This disease had been noted in Israel before 1951, and the causal agent is apparently the same as the unidentified organism reported in the past as killing giant willow aphids in California and British Columbia and ambrosia aphids in Illinois.

INTRODUCTION

In early May 1975, high mortality was noticed in dense infestations of peach trunk aphids, *Pterochloroides* (= *Lachnus*) *persicae* (Cholodkovsky) (Lachnidae) on four Japanese plum and almond trees at Rishon-le-Zion and Rehovot, in the coastal plain of Israel. One plum and one almond tree of those sampled at Rehovot were not irrigated.

No chemicals had been applied to these trees for several years. The bodies of apterous and alate aphids were found hanging downwards from branches and twigs by their long probosces in a manner resembling clothes hung on a line. Others were stuck to leaves upon which they had dropped by the great amount of honeydew produced by the aphids above which had covered the leaves. Microscopic examination revealed an entomophthorous mycosis in the dead aphids. Two spore states were present, conidial sporulation from some, resting spore formation within others. By early June it was difficult to find new infections. On these isolated trees, infections by the same fungus reoccurred, starting in mid-April of 1976 and in mid-May of 1977. Maggots of the predatory gall midge, *Aphidoletes aphidimyza*, which are known to destroy entire colonies of these aphids (Bodenheimer and Swirski, 1957), were present on the trees at Rishon-le-Zion, but did not appear in Rehovot; therefore, we attribute the very high mortality at Rehovot during the first year to the disease.

A major epizootic of this large aphid, which attacks stone-fruit trees in southeastern Europe, central Asia, India, and the Middle East (Avidov and Harpaz, 1969), had been encountered by Plaut (1951) in the coastal plain of Israel in April and May of 1947 and 1948. He stressed that the stricken insects were liquefied and hung by their rostra in the form of a drop of fluid; upon pricking the bodies with a needle, they burst open, spewing out a dark liquid containing numerous large black spore-like bodies. Plaut sent examples for identification to Dr. E. A. Steinhaus in California who informed him of a similar disease in several aphid species from the United States, with spores of a unique kind, but that it would seem that the symptom of liquefaction of the dead aphid was not characteristic of a fungal infection. Steinhaus (1951), under the heading "Unidentified fungus infection of aphids," mentioned having received this material, which he stated appeared to be infected with the same type of fungus as other stricken aphids he described from California and Illinois; these he thought to be possibly of the Fungi Imperfecti or phycomycetes. Essig (1926) reported a disease of the giant willow aphid, *Pterochlorus viminalis* (B. de Fonsc.) collected in August of 1911 near Santa Paula, California which "causes the bodies to melt away and kills great numbers in Southern California." In British Columbia during 1941, the same aphid species was stricken

by a disease which "literally liquefied the bodies into black drops which fell to the ground" (Spencer, 1945). According to Steinhaus, Dr. J. N. Couch also examined Essig's microscopic slide preparations and believed the disease to be caused by a fungus possibly belonging to the Hyphomycetes. During September of 1946, ambrosia aphids, *Macrosiphum ambrosiae* (Thos.), from Mahomet, Illinois, were affected by the same disease. According to Steinhaus (1951), microscopic slide preparations of the diseased insects from California and Illinois revealed "peculiar conidia-like or spore-like bodies....dark-colored, oval-shaped....with approx. dimensions of 20 x 35 microns. Two distinct walls appear to surround the main body of the spore....; an attachment structure frequently may be seen at one end. The mycelium....is present primarily in fragments." Steinhaus stressed that both he and Couch had been unable to find anything in the literature which resembled the material examined. Published photographs of the spore-like bodies from the American aphids (Steinhaus, 1951: Figs. 8, 9) were exactly comparable to the drawings we saw of spores made by Plaut, and to the inclusions we found in peach trunk aphids. These structures are not at all like conidia but strongly resemble the zygospores of *Entomophthora fresenii* (Nowakowski) Gustafsson, the only known entomophthorous fungus which possesses resting spores with both a jet-black episore together with a subovoid broadly elliptical shape (Soper and MacLeod, 1963; MacLeod and Müller-Kögler, 1970). The "*Entomophthora* sp." found in Quebec by Smirnoff and MacLeod (1973) on *Cinara curvipes* Patch on balsam fir branches formed only resting spores within the aphids, which then liquefied; these spores bear a striking resemblance to those mentioned above, and it is possible that they belong to the same species under consideration here, if not *E. fresenii*.

DESCRIPTION OF DISEASE AND PATHOGEN

In aphids from which conidia were discharged, there was no noticeable change in color and shape. Sporulation was characterized by a glistening, brownish pebbly surface on the lower side of the abdomen where a dense palisade of subhyaline to reddish conidiophores emerged from the cuticle; under the microscope this hymenial surface appeared like irregular cobblestones. Sporulation was almost always restricted to the lower and lateral sides of

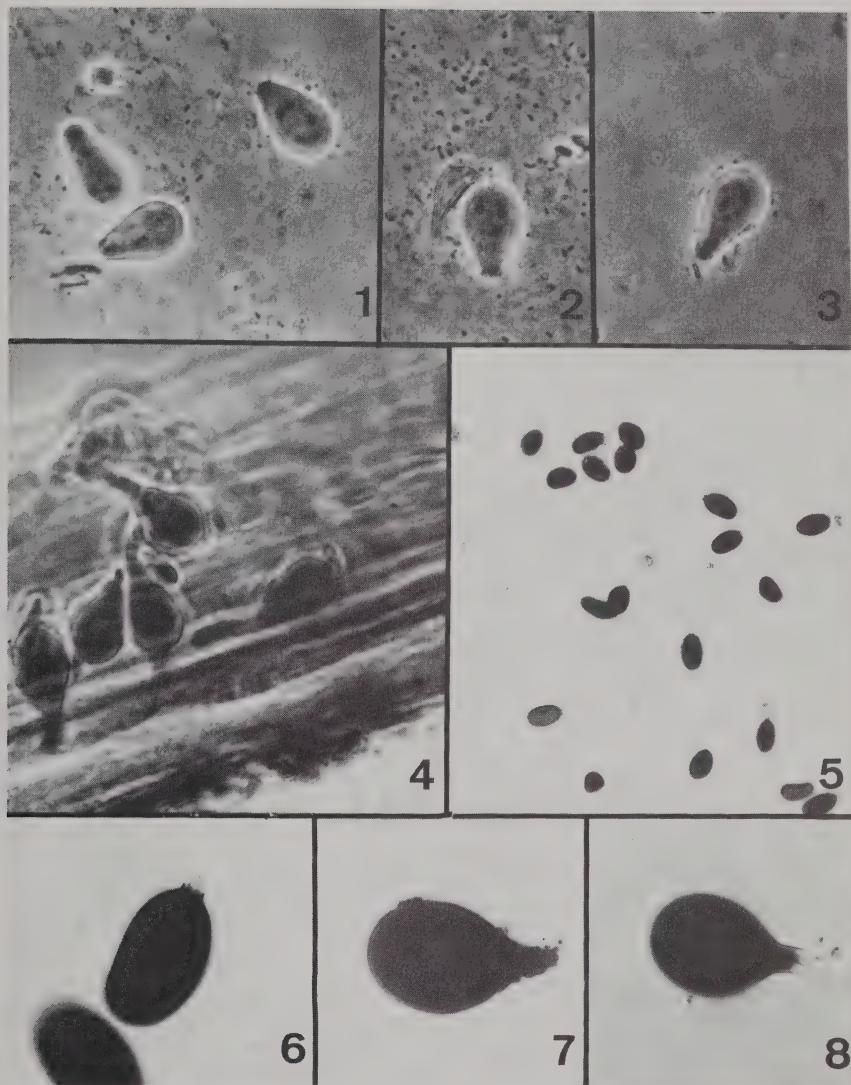
the abdomen and, occasionally, of the thorax; sporulation rarely occurred on the upper side of the abdomen. Conidiophores were simple, short, broad, and often broader just below the point of conidial attachment. Observations on sporulation were hindered by the white pruinosity of the healthy aphids, by the grey-black appearance of the abdomen of infected insects, by the rich growth of saprobic fungi such as *Cladosporium* spp. on most specimens (particularly those covered with honeydew), by the extrusion of dark-brown to reddish fluid from infected aphids in squash preparations, and by the very shortness of the conidiophores themselves.

In moist chambers, conidia were not thrown farther than 3 mm from the aphids. In microscopic preparations, the color of most of the conidia was light-brownish to reddish-brown. This color was restricted to the cytoplasm and did not leach upon transferring spores to fresh lactophenol mounting medium; the spore walls were hyaline. Some mature spores were completely hyaline.

Younger conidia were obovate, and upon maturity became long-turbinate (obconical), (*Turbinata*-type according to Lakon, 1919) (Figs. 1, 2, 3); mature conidia generally taper evenly to a blunt but narrow base which is sometimes slightly papillate; $(17.6)19.3-22.5(25.7) \times (11.2)12.2-16.0\mu$ (mean: $19.8 \pm 2.0 \times 13.1 \pm 1.3\mu$), with length:width range of 1.20-1.86 (mean: $1.52 \pm .13$) (75 measurements in lactophenol). The outer wall of the conidium sometimes was seen to separate from the inner wall along the sides. Conidia stained with Delafield's haematoxylin contained five to seven or more nuclei (Figs. 1, 2, 3). Conidia often germinated *in situ* on aphids, and invariably produced through the basal papilla a wide, rarely branching germ tube (Fig. 4). No type of secondary conidia was ever encountered. Conidia were often seen clinging to legs of non-stricken dead aphids, mostly by the narrow basal end, as if that part alone was adhesive.

(Rhizoids and cystidia were never seen. Hyphal bodies were usually reddish, wide, long and irregular, but became shorter after the septation and evacuation of cytoplasm from some sections.

(The shiny black resting spores were exuded in a dark liquid from the easily ruptured aphids. A single aphid was



FIGURES 1-8. *Entomophthora turbinata*: 1-3. Conidia stained with Delafield's haematoxylin, showing nuclei. 4. Germination of conidia through the papilla, on antenna of peach trunk aphid. 5-8. Black resting spores. 5-6. The most common types. 7-8. Other types, showing exaggerated prolongation at one side. (All in lactophenol, approx. x 700; Figure 5, approx. x 140).

found filled with immature, hyaline, thick-walled broad-elliptical spores; they had a small process at the extremity of the slightly wider end; $(28.4-31.6 \times 17.4-22.2\mu)$. All other specimens had spores of approximately the same shape as the above. Mature resting spores were jet-black, smooth, with a more prominent subhyaline protuberance at one end $31.6-41 (44.2) \times (15.8) 17.4-23.7 (25.3) \mu$ (50 measurements, including the protuberance). The shape and dimensions of resting spores from one individual aphid were usually fairly uniform, but sometimes varied considerably (Figs. 5, 6, 7, 8). Occasionally there was a concavity in spores, coupled with a tendency toward a slight bending. When pressure was exerted on the cover slip of a slide, the thin black epispore ruptured, revealing a thick-walled hyaline spore underneath.

IDENTIFICATION OF THE PATHOGEN

More than fourteen *Entomophthora* species are described from aphids (Hall, 1973; Thoizon, 1970), but none possess conidia as small as those found on the peach trunk aphid. Only two entomopathogenic species have conidia resembling those of the peach trunk aphid: (1) *E. montana* (Thaxt.) Gustafsson, which has uninucleate conidia $15-25 \times 11-18\mu$ according to Thaxter (1888), and $17-26 \times 10-19\mu$ as reported by Gustafsson (1965). It produces digitate conidiophores, however, and forms rhizoids and cystidia, and has only been found on Diptera. (2) *Strongwellsea castrans* Batko and Weiser (1965), has uninucleate, broadly papillate conidia (Humber, 1976) that are produced within a concavity in the abdomen of muscoid flies. The hyaline, sphaerical resting spores of *E. virulenta* (Thoizon, 1967), and the orange, spiny, sphaerical resting spores of *S. castrans* (Wilding, 1967; Humber, 1976) were never found in any of our specimens.

The common occurrence of smooth, elongate black resting spores in the Israeli material raises the question whether or not they belong to the same species as the conidia-producing fungus, or whether they belong to *E. fresenii*, which is common in Israel and elsewhere. If the former is true, then the fungus must be a new undescribed species, if the latter, it could possibly be a deviant of *E. montana*. It is not likely that the resting spores are those of *E. fresenii*, because the conidia of

that fungus was never encountered emerging from the peach trunk aphid, nor from various aphids in their near vicinity, even though in Israel this species produces conidia more often than resting spores. In contrast, the separate conidial and resting spore forms of the fungus have been found on peach trunk aphids on the same trees in a number of locations. Also, members of the Lachnidae have very seldom been found infected by *Entomophthora*, anywhere in the world: *Tuberolachmus salignus* (Gmel.) by *E. aphidis* Hoffm. (Leatherdale, 1970); *Cinara pinea* Mordv. and *C. todocola* In. by *E. aphidis* (Thoizon, 1970); *Cinara curvipes* Patch by *Entomophthora* sp. (Smirnoff and MacLeod, 1973); *Schizolachmus piniradiatae* (Davidson) by *E. aphidis* (Thoizon, 1970) and *E. fresenii* (Thoizon, 1970). The report by Tsinovskii and Egina (1972) of various *Entomophthora* species attacking peach-potato aphid, "*Lachnus persicae*" in Latvia obviously was referring to *Myzus persicae*. It is unlikely that a single aphid species of this group would suffer from disease caused by the same pair of different species at a number of widely dispersed localities. Studies in culture would conclusively prove the connection between the two spore states, but the fungus has not yet been obtained in pure culture. The more than occasional appearance in peach trunk aphids of mature resting spores with a long narrow prolongation at one end (Figs. 7, 8), which does not seem to have been figured or described in various papers dealing with *E. fresenii*, might be further evidence that the former is another species. On these grounds, we therefore consider the small conidia and black resting spore to be from the same species. A search should be made for the conidial stage in other Lachnidae.

An *Entomophthora* with conidia greatly resembling those on peach trunk aphid was found near Rehovot in May 1977 on *Aphis craccivora* in alfalfa (Kenneth and Ben Ze'ev, unpublished). Numerous very broad cystidia were formed, but no resting spores were observed. Secondary conidia were produced, something that did not occur in the peach trunk aphid fungus. It has been impossible to determine a relationship between this fungus and the one considered in this paper.

The peach trunk aphid fungus does not fall into any of the zoophilic genera of Entomophthoraceae as delineated by Batko and Weiser (1965), as the "monosporic sporangiola"

would place it only in *Zoophthora* Batko or *Strongwellsea*, both of which have only one nucleus in the conidium.

ENTOMOPHTHORA TURBINATA SP. NOV.

Conidia symmetria, recta, turbinata vel obovoidea, apice late rotundo, sursum ad angustam basem leniter attenuata, perparvis papillis; hyalina aut brunneo vel rubricoso cytoplasmate; 5-7 nucleata; externo pariete partim disjuncte, 17.7-25.7 x 11.2-16 μ ; per papillas germinantia. Secundaria conidia ignota. Conidiophoris brevibus, simplicibus, paliformibus, praecipue de infero ventre aligando de thorace; aphidis probosce ad substratum affixis. Rhizoideis et cystidiis absentibus. Perduribus sporis intra hospitem tumidum, nitentem in liquore innatis; ex late ellipticis ad subovoidea, 31.6-44.2 x 15.8-25.3 μ , atropiceo, laeve episporio et ad unum extremum subhyalino processu, aligando corpore elongato anguste extenso. Hospes: Rhynchota: *Pterochloroides* (= *Lachmus*) *persicae* Cholodkovsky (Lachnidae): *Prunus amygdalus* Batch, *P. salicina* Lindl., Rishon-le-Zion, Rehovot, Israel, May, 1975.

Conidia symmetrical, straight, turbinate to obovoid, with a broadly rounded apex, tapering uniformly toward a narrow base with a very small papilla; hyaline or with brown to reddish-brown cytoplasm; 5-7 nucleate; outer wall partially separating; 17.7-25.7 x 11.2-16 μ ; germinating through the papilla. Secondary conidia unknown. Conidiophores short, simple, in palisade, mainly from underside of abdomen, occasionally of thorax; aphids attached to substratum by proboscis. Rhizoids and cystidia absent. Resting spores produced in liquid within bloated, shiny host, which turns to tear-drop shape; broadly elliptical to subovoid, 31.6-44.2 x 15.8-25.3 μ , with jet-black smooth episporio and with subhyaline protuberance at one end, occasionally with narrow elongate prolongation of body. Host: Rhynchota: *Pterochloroides* (= *Lachmus*) *persicae* Cholodkovsky (Lachnidae): *Prunus amygdalus* Batch, *P. salicina* Lindl., Rishon-le-Zion, Rehovot, Israel, May, 1975.

The holotype (Microscopic preparation) will be deposited at the National Fungus Collection, (BPI) Beltsville, Maryland; paratype material is deposited at

the Department of Plant Pathology, Faculty of Agriculture, Hebrew University, Rehovot, Israel.

ACKNOWLEDGEMENT

This research was supported by a grant from the United States-Israel Binational Science Foundation (BSF), Jerusalem, Israel. We thank Dr. R. S. Soper, Agricultural Research Service, USDA and Dr. R. A. Humber, Department of Entomology, University of Maine, Orono, Maine, for fruitful discussions on the subject and Professor David Tatem, University of Maine, Orono, Maine, for the Latin diagnosis.

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MYCOTAXON

Vol. VI, No. 2, pp. 391-417

October-December 1977

A CONTRIBUTION TO THE GENUS *TRICHOSPORON*

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SUMMARY

Strains of all available species of *Trichosporon*, including the type strains, were examined morphologically and physiologically. *Trichosporon aquatile* and *T. jerovecii* are considered synonyms of *T. beigelii*. *Trichosporon aculeatum*, *T. arenicola*, *T. fennicum*, *T. inkin*, *T. melibiosaceum*, *T. oryzae*, and *T. penicillatum* are excluded from the genus. *Candida hellenica* comb. nov. is proposed to accommodate *Trichosporon hellenicum*. A synoptic key is provided for the identification of the six recognized species of *Trichosporon* (*T. beigelii*, *T. capitatum*, *T. fermentans*, *T. pullulans*, *T. eriense*, and *T. brassicae*).

The genus *Trichosporon* has been implicated in human disease for about 100 years (Behrend, 1890; Rabenhorst, 1867). It is about this time also that the taxonomic history of this group begins. *Trichosporon beigelii* (Kuch. & Raben.) Vuillemin (1902) [= *T. cutaneum* (De Beurm. et al.) Ota (1926)] is the most numerous species of the genus and is cosmopolitan in distribution. It is encountered as a saprophyte in a great diversity of habitats, from fresh and marine water to plant detritus to the body surfaces and sputum of man (Carmo-Sousa, 1970; Rippon, 1974). The other species are less numerous and thus less frequently encountered. It may be for this reason that they have been reported from a less diverse range of habitats, though several have been reported from materials of both plant and animal origin.

Since the monograph of Carmo-Sousa, 8 species of *Trichosporon* have been described, and it thus appeared that another treatment of the genus would be of value. Jong & King (1977) placed one of these recently described species, *Trichosporon oryzae* Ito *et al.* (1974), in synonymy with *Candida edax* van der Walt & Nel (1968).

The characteristics an imperfect fungus must have to be assigned to *Trichosporon* (Carmo-Sousa, 1970) are the presence of a unicellular phase consisting of budding cells and septate (true) mycelium from which arthroconidia (=arthrospores) are formed. In studying strains and descriptions of species assigned to this genus, it became apparent that the generic criterion most difficult to ascertain is whether the fungus in question forms arthroconidia. In many fungi in which the hyphae are septate at more or less regular intervals, a number of the hyphal segments may break apart at some stage of development. However, the definition of arthroconidia given in the Dictionary of the Fungi (Ainsworth, 1971) notwithstanding, the separation of hyphal segments one from another is not sufficient alone to consider those segments arthroconidia, at least in this genus.

King & Jong (1976b) gave the following criteria for identifying arthroconidia in *Trichosporon* based on light microscopic observations: arthroconidia (1) are produced by septation of recently determinate hyphae (relatively young hyphae that have ceased to elongate), (2) are produced in chains with no empty cells between the conidia, (3) break apart prior to further development, i.e. production of germ tubes or blastospores, and (4) separation of arthroconidia in a chain takes place in a very short time span, i.e., maturation is reached nearly simultaneously. These criteria are essentially the same as those enumerated by Cole (1975) based on light and electron microscopic data, with the exception that Cole states that arthroconidia in this genus may proliferate prior to separating from the chain of conidia. Representative aspects of arthroconidia in this genus are depicted in Figs. 1-3.

Although the distribution of members of this genus is cosmopolitan, the geographical areas in which they are known to cause disease is more limited. White piedra, caused by *T. beigelii*, is a rather benign disease of the hair in man and is by far the most common disease due to this genus (Gentles & Touche, 1969). According to Emmons *et al.* (1977) it occurs in temperate and tropical regions of Europe, Asia and South America, and rarely in the Southern United States. Rippon (1974) states that the condition occurs sporadically in the United States and Europe, and more commonly in South America and the Orient.

More serious diseases caused by members of this genus are rare. Species of *Trichosporon* have been implicated in bovine mastitis (Jungerman & Schwartzman, 1972), and *T. capitatum* has been implicated in pulmonary disease of man (Rippon, 1974). *Trichosporon beigelii* (as *T. cutaneum*) has also been found to cause pulmonary and systemic infections (Rippon, 1974), in deep gummatous lesions and from one case of fatal disseminated mycosis (Emmons *et al.*, 1977).

Carmo-Sousa (1970) provided the most recent comprehensive taxonomic treatment of the genus *Trichosporon* Behrend. She accepted as valid only 7 of the species that had been described as having only the imperfect *Trichosporon* state, and one (*T. variabile* (Lindner) Delitch.) that also had a perfect state. The species with only an imperfect state accepted by Carmo-Sousa (1970) were *Trichosporon aculeatum* Phaff *et al.* (1956), *T. capitatum* Diddens & Lodder (1942), *T. inkin* (Oho) Carmo-Sousa & Van Uden (1967), *T. penicillatum* Carmo-Sousa (1965), and *T. pullulans* (Lindner) Diddens & Lodder (1942). During the course of the work leading to the present treatment of the genus, two of these species have been excluded. *Trichosporon inkin* is now the type species of *Sarcinosporon inkin* (Oho) King & Jong (1975) and *Aciculococonidium aculeatum* King & Jong (1976a) has been erected to accommodate *T. aculeatum*. Von Arx *et al.* (1977) transferred *T. capitatum*, *T. fermentans*, and *T. penicillatum* to *Geotrichum*; we accept the transfer of only *T. penicillatum* for reasons discussed below. Carmo-Sousa (1970) reported that cultures of five species were not available: *Trichosporon luchetti* Redaelli & Ciferri (1941), *T. intermedium* Florenzano (1950), *T. merulioides* Kobayashi (1953), *T. neofermentans* Kobayashi (1953), and *T. yamanashiensis* Yokotsuka & Goto (1955).

METHODS AND MATERIALS

Strains examined. The fungal strains accessioned to the American Type Culture Collection (ATCC) Mycological collection as species of *Trichosporon* (Tables I and II) were examined morphologically and physiologically as described below. The fungus strains accessioned as species of genera other than *Trichosporon* (Table III), although they were originally described as species of that genus, were examined only for arthroconidia production as described under morphology.

Morphology. Media used were Difco corn meal agar (CM); 2% dextrose, 0.5% Difco yeast extract, 1.0% Difco peptone, with 1.5% agar for solid media (GYEP); Difco yeast malt agar (YM); Difco malt agar (MA); infusion from 500 g potatoes, 20 g dextrose, 15 g agar, distilled water to make 1 liter (PDA); and 2% Difco malt extract, 0.5% Difco yeast extract, 40% sucrose, 2% Difco agar (M40Y). All media were sterilized by autoclaving at 15 psi for 15 min. All cultures were incubated at room temperature (22±2C) unless otherwise indicated.

Using CM and GYEP agars, slide and Dalmau cultures were prepared according to the methods of Lodder (1970). The slide cultures were examined at 4 and 7 days, and the Dalmau cultures at 4 and 7 days, and at intervals up to 30 days. Stationary cultures in 30 ml of GYEP broth in 100 ml cotton plugged flasks were examined 2 and 4 days after inoculation for detection of unicellular growth.

Strains that failed to produce a unicellular budding growth using the above methods were grown at 37 C on YM agar slanted in test tubes and at 24 C on GYEP and M40Y agars in Petri dishes in candle jars, and examined after 7 days incubation for the presence of unicellular budding growth.

The strains accessioned as other than *Trichosporon* species were streaked onto CM, GYEP, PDA, MA and M40Y agars in Petri dishes and examined for the presence of arthroconidia 7 days after inoculation. The strains accessioned as species of *Trichosporon* but that failed to produce arthroconidia on CM and GYEP agars in slide and Dalmau cultures were inoculated and examined in the same manner as the non-*Trichosporon* strains on PDA, MA and M40Y agars.

TABLE I. ATCC STRAINS OF SPECIES CONSIDERED BY CARMO-SOUSA (1970), AND ACCESSIONED AS *TRICHOSPORON*^a

<u>Name</u>	<u>ATCC No.</u>	<u>Name</u>	<u>ATCC No.</u>
<i>T. beigelii</i> ^b	757	<i>T. fermentans</i>	10675 ^d
	4155		28577
	10267		28578
	11115	<i>T. penicillatum</i>	18019 ^d
	14905		
	13445	<i>T. pullulans</i>	9331
	14254		10677 ^d
	14255	<i>T. hellenicum</i> ^c	15542 ^d
	22164		28579
	22375	<i>Trichosporon</i> sp.	4151
	26466		10266
	28592 ^d		20187
<i>T. capitatum</i>	10663 ^d		28330
	28575		
	28576		
	28591		

a *Sarcinosporon inkin* (= *T. inkin*) and *Aciculoconidium aculeatum* (= *T. aculeatum*) are not included.

b Considered *T. cutaneum* by Carmo-Sousa (1970).

c Excluded from *Trichosporon* by Carmo-Sousa (1970).

d Type strain of the species.

TABLE II. ATCC STRAINS OF *TRICHOSPORON* SPECIES
NOT CONSIDERED BY CARMO-SOUSA (1970).

<u>Name</u>	<u>ATCC No.</u>	<u>Source of Description</u>
<i>T. aquatile</i>	22310 ^a 28574	Hedrick & Dupont (1968)
<i>T. brassicae</i>	24124 ^a	Nakase (1971)
<i>T. eriense</i>	22311 ^a	Hedrick & Dupont (1968)
<i>T. fennicum</i>	18895 ^a	Sonck & Yarrow (1969)
<i>T. jerovecii</i>	34499 ^a	Fragner (1969)
<i>T. melibiosaceum</i>	28580 28681	Scott & van der Walt (1970)
<i>T. oryzae</i> ^b	28323 ^a 32189	Ito <i>et al.</i> (1974)

a Type strain of the species.

b Considered a synonym of *Candida edax* by Jong and King (1977).

TABLE III. ATCC TYPE STRAINS ORIGINALLY DESCRIBED AS *TRICHOSPORON*
SPECIES BUT ACCESSIONED TO THE ATCC UNDER OTHER NAMES

<u>ATCC No.</u>	<u>Original Name</u>	<u>Name as Accessioned</u>	<u>Source of Description as <i>Trichosporon</i></u>
10676	<i>T. margaritiferum</i>	<i>Oosporidium margaritiferum</i>	Buchwald (1939)
18817	<i>T. diddensii</i>	<i>Candida diddensii</i>	Phaff <i>et al.</i> (1952)
22975	<i>T. maritimum</i>	<i>Candida maritima</i>	Siepmann & Hohnk (1962)
28774	<i>T. lodderei</i>	<i>Candida tropicalis</i>	Phaff <i>et al.</i> (1952)
28870	<i>T. dendriticum</i>	<i>Candida krusei</i>	Cifferi & Redaelli (1935)
28871	<i>T. piscium</i>	<i>Candida zeylanoides</i>	Siepmann & Hohnk (1962)
28872	<i>T. atlanticum</i>	<i>Candida diddensii</i>	Siepmann & Hohnk (1962)
28873	<i>T. appendiculare</i>	<i>Candida guilliermondii</i>	Batista <i>et al.</i> (1959)
28874	<i>T. veronae</i>	<i>Candida veronae</i>	Floranzano (1953)

Physiology. For inoculations in all physiological tests, the growth after 2 days on YM agar slanted in a test tube was aseptically scraped off and suspended in 6.5 ml of sterile distilled water, and the suspended cells drawn into a sterile disposable syringe equipped with a 20 gauge needle. Each tube of test medium was inoculated with one drop of the suspension. All tests were performed in duplicate, and all cultures were incubated non-shaken at room temperature (22 ± 2 C).

Carbon assimilation tests were similar to those performed by Wickerman (1951). All sources (Table IV) were filter sterilized, except starch and inulin which were autoclaved at 15 psi for 15 min. The carbon sources were used at a level of 0.5% in 5 ml of Difco yeast nitrogen base, except raffinose at 1.0%. The pH of all media was unadjusted. Cultures were evaluated for presence or absence of growth over a 30-day period of incubation.

The assimilations of the following nitrogen sources at the concentrations indicated were tested: KNO_3 , 0.078%; NaNO_2 , 0.026%; ethylamine HCL, 0.064%; and as a positive control, NH_4NO_3 , 0.10%. For each nitrogen source, duplicate tubes of 5 ml Difco yeast carbon base with the nitrogen source were inoculated and after 10 days, these cultures were suspended using a test tube mixer, and 1-3 drops of the suspension from a Pasteur pipette was used to inoculate a second set of tubes. The second set of tubes contained a basal medium (glucose, 5 g; KH_2PO_4 , 1 g; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.5 g; FeCl_3 , 0.6 mg; $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$, 0.9 mg; $\text{MnSO}_4 \cdot \text{H}_2\text{O}$, 0.3 mg; biotin, 5 μg ; thiamine, 100 μg ; distilled water, 1 liter) and the nitrogen source. The NH_4NO_3 was not used in the first set of tubes, and was inoculated from the first set of KNO_3 cultures, along with the second set of KNO_3 tubes. The second set of tubes were examined for the presence of growth after 10 days.

As a test for vitamin-free growth, duplicate tubes of Difco vitamin-free yeast base were inoculated and after 10 days, a second set of tubes containing NH_4NO_3 and the basal medium without vitamins was inoculated from the first set, and examined for growth after 10 days.

Duplicates of GYEP agar slanted in test tubes were inoculated and examined for growth after 4 days incubation at 30, 37, 45 and 50 C. Duplicate tubes of arbutin medium

(arbutin, 1.25%; yeast extract, 1.25%; ferric ammonium sulfate, 0.125%; agar, 1.0%) were inoculated and examined after 10 days for darkening. Duplicate tubes of urea medium (Difco urea agar base, pH adjusted to 6.8; 1.5% agar) were inoculated and examined after 10 days for reddening.

The ability to ferment glucose was tested using the OF method (Hugh & Liefson, 1953). Difco OF basal medium + 3.0% glucose was inoculated as stabs and melted vaspar (50% vaseline + 50% paraffin) was poured over the top of the inoculated stabs. Following solidification, the vaspar provided a gas-tight seal. Duplicate stabs were inoculated and incubated at room temperature until gas was apparent beneath the vaspar plug or for 10 days. Presence of gas was considered positive for fermentation.

RESULTS

Morphology. Strains of most of the species listed in Tables I and II produced arthroconidia on either CM or GYEP agars. The exceptions were the strains referable to *T. hellenicum* (ATCC 15542 and 28579), *T. melibiosaceum* (ATCC 28580 and 28681), *T. fennicum* (ATCC 18895), and *T. oryzae* (ATCC 28323 and 32189). None of the strains listed in Table III produced arthroconidia on any media used.

Strains referable to other species that failed to produce arthroconidia on either CM or GYEP agars were the strains of *T. beigelia* ATCC 28592 (the type strain), ATCC 22375, and ATCC 22164; *T. pullulans* strain ATCC 10677; *T. eriense* strain ATCC 22311; *T. brassicae* strain ATCC 24124; and *Trichosporon* sp. strain ATCC 14905. However, these strains have been shown to produce arthroconidia using methods and media other than those reported here (King & Jong, 1976b). The remaining strains listed in Table I produced at least some arthroconidia on CM.

The unicellular budding phase was generally produced most readily in GYEP broth. Those strains that failed to produce a unicellular budding phase either in GYEP broth or on CM or GYEP agars were *T. beigelia* strains ATCC 757, 11115, 13445, 14254, 14255 and 26466; *T. capitatum* strain ATCC 28575; and *Geotrichum penicillatum* (= *T. penicillatum*) ATCC 18019. None of these strains produced the unicellular phase at 37 C on GYEP agar. In candle jars, *T. beigelia* strain 11115 produced blastoconidia on GYEP agar and

TABLE IV. UTILIZATION OF CARBON SOURCES
BY STRAINS ACCEPTED IN *TRICHOSPORON*

C-Source ATCC No.	Glucose	Galactose	L-Sorbose	Sucrose	Maltose	Cellobiose	Trehalose	Lactose	Melibiose	Raffinose	Melezitose	Inulin	Soluble Starch	D-Xylose	L-Arabinose	D-Arabinose	D-Ribose	L-Rhamnose
<i>T. aquatile</i>																		
22310	+	+	-	+	+	+	+	+	-	-	+	-	+	+	+	+	+	-
28574	+	+	-	+	+	+	+	+	-	-	+	-	+	+	+	+	+	-
<i>T. beigelii</i>																		
4155	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
10267	+	+	-	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+
11115	+	+	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+
14905	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
22164 ^a	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
22375	+	-	-	-	+	+	+	+	-	-	-	-	+	+	+	-	+	-
28592	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+
<i>T. brassicae</i>																		
24124	+	+	+	+	+	-	+	-	-	-	-	-	+	+	+	-	+	-
<i>T. capitatum</i>																		
10663	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
28575	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28576	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
28591	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. erienne</i>																		
22311	+	-	+	-	-	+	-	-	-	-	-	-	+	+	-	-	-	-
<i>T. fermentans</i>																		
10675	+	+	+	-	-	+	-	-	-	-	-	-	+	+	-	-	-	-
28577	+	+	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-
28578	+	+	+	-	-	+	-	-	-	-	-	-	-	+	-	-	+	-
<i>T. jerovecii</i>																		
34499	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+
<i>T. pullulans</i>																		
9331	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
10677	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	-	+	+
<i>Trichosporon</i> sp.																		
4151	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+
10266	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+
20187	+	+	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+
28330	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

a Accessioned as *T. cutaneum* var. *antarcticum*.

TABLE IV. (continued)

C-Source ATCC No.		D-Glucosamine	Ethanol	Glycerol	D-Erythritol	Adonitol (Ribitol)	Dulcitol (Galactitol)	D-Mannitol	D-Sorbitol (D-Glucitol)	α -Methyl-D-Glucoside	Salicin	Inositol	DL-Lactic Acid	Citric Acid	Succinic Acid	L-Valine	Glycine	L-Proline	L-Arginine
<i>T. aquatilis</i>																			
	22310	+	+	+	+	-	-	-	+	+	-	-	-	-	-	+	+	+	-
	28574	+	+	-	+	-	-	-	+	+	+	-	-	-	-	-	+	+	-
<i>T. beigelii</i>																			
	4155	+	+	+	+	+	-	+	+	+	+	+	-	-	-	-	+	+	+
	10267	+	+	+	+	-	-	+	+	+	+	-	-	-	-	+	+	+	-
	11115	+	+	+	+	-	-	+	+	+	+	+	-	-	-	+	+	+	-
	14905	+	+	+	+	-	-	+	-	+	+	-	-	-	-	+	+	+	-
	22164 ^a	+	+	+	+	+	-	+	+	+	+	+	-	-	+	+	+	+	+
	22375	+	+	+	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
	28592	+	+	+	+	+	-	+	+	+	+	+	-	-	-	+	+	+	+
<i>T. brassicae</i>																			
	24124	+	+	+	-	+	-	+	+	-	-	+	+	-	+	+	+	+	+
<i>T. capitatum</i>																			
	10663	-	+	+	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-
	28575	-	+	+	-	-	-	-	-	-	-	-	+	+	+	-	-	+	+
	28576	-	+	+	-	-	-	-	-	-	-	-	+	+	+	+	-	+	+
	28591	-	+	+	-	-	-	-	-	-	-	-	+	+	+	+	-	+	+
<i>T. eriense</i>																			
	22311	-	+	+	-	-	-	+	+	-	+	-	+	+	+	+	+	+	+
<i>T. fermentans</i>																			
	10675	-	+	+	-	+	-	+	+	-	+	-	+	+	+	+	+	+	+
	28577	-	+	+	-	+	-	+	+	-	+	-	+	+	+	+	+	+	+
	28578	-	+	+	-	+	-	+	+	-	+	-	+	+	+	+	+	+	+
<i>T. jerovecii</i>																			
	34499	+	+	+	+	-	+	+	+	+	+	+	-	-	-	+	+	+	+
<i>T. pullulans</i>																			
	9331	-	+	-	+	+	-	+	+	+	+	+	-	-	+	-	-	+	-
	10677	-	+	-	+	+	-	+	+	+	+	+	-	-	+	-	-	+	-
<i>Trichosporon</i> sp.																			
	4151	+	+	+	+	-	-	+	+	-	-	+	-	-	+	+	+	+	+
	10266	+	+	+	+	-	+	+	+	+	-	+	-	-	-	+	+	+	+
	20187	+	+	+	+	+	-	+	+	+	+	-	-	-	+	+	+	+	+
	28330	+	+	+	+	+	-	+	+	+	+	+	-	-	-				

TABLE V. REACTIONS TO MISCELLANEOUS PHYSIOLOGICAL TESTS BY STRAINS
ACCEPTED IN *TRICHOSPORON* SPECIES

Name and ATCC No.	Growth at 30C 37C 45C	Growth on KNO_3	Growth on Nitrogen From NaNO_2 $\text{C}_2\text{H}_5\text{NH}_2\cdot\text{HCl}$	Growth -Vitamins	Enzyme tests Urease Arbutin ^a	Glucose Ferm.
<i>T. aquatile</i>						
22130	+	-	+	-	+	-
28574	+	-	+	-	+	-
<i>T. beigelii</i>						
4155	+	-	+	-	+	-
10267	+	-	+	-	+	-
11115	+	-	+	-	+	-
14905	+	-	+	-	+	-
22164	+	-	+	+	+	-
22375	+	-	+	-	+	-
28592	+	-	+	-	+	-
<i>T. brassicae</i>						
24124	+	-	+	+	+	-
<i>T. capitatum</i>						
10663	+	-	+	-	-	-
28575	+	-	-	-	-	-
28576	+	-	+	-	-	-
28591	+	-	+	-	-	-
<i>T. erienne</i>						
22311	+	-	+	-	-	-

a Splitting of arbutin

TABLE V. (continued)

Name and ATCC No.	Growth at		Growth on Nitrogen From		Growth -Vitamins	Enzyme tests		Glucose
	30C	37C 45C	KNO_3	NaNO_2	$\text{C}_2\text{H}_5\text{NH}_2 \cdot \text{HCl}$	Urease	Arbutin ^a	Ferm.
<i>T. fermentans</i>								
10675	+	-	-	-	+	-	-	+
28577	+	-	-	-	+	-	-	+
28578	+	-	-	-	-	-	-	+
<i>T. jerovecii</i>								
34499	+	-	-	+	+	+	-	-
<i>T. pullulans</i>								
9331	-	-	+	+	+	+	+	-
10677	-	-	+	+	+	+	-	-
<i>Trichosporon</i> sp.								
4151	+	-	-	-	-	+	-	-
10266	+	-	-	+	+	+	-	-
20187	+	-	-	+	+	+	-	-
28330	+	-	-	-	+	+	-	-

T. capitatum strain ATCC 28575 produced budding cells on M40Y agar. All of the strains listed in Table III readily produced the unicellular budding phase under all conditions. The budding phase of *Trichosporon capitatum* is unique within the genus (Figs. 4-6). The spores are produced in succession from a phialidic protuberance.

Physiology. For those strains in which the production of arthroconidia was observed or reported by King & Jong (1976b), and in which a unicellular budding phase was observed, the carbon assimilation results are presented in Table IV, and the results of the other physiological tests are presented in Table V. All strains utilized glucose and ethanol as carbon sources, and NH_4NO_3 as a nitrogen source.

Considering *T. beigelii* and strains designated *Trichosporon* sp. together, all strains utilized as carbon sources all disaccharides except sucrose (negative only for ATCC 22375), soluble starch, D-xylose, D-ribose, glycine and L-proline (except possibly strain ATCC 28330 for the last two, on which it was not tested). Also, all of these strains showed a positive urease reaction, and failed to grow at 45 C, utilize nitrate, or ferment glucose. All but one (*T. beigelii* strain ATCC 22164) failed to grow in vitamin-free medium. All of them also failed to utilize lactic and citric acids as carbon sources.

The strains of *T. capitatum* were most notable for the few carbon sources utilized. Of the carbon sources tested, these strains failed to utilize the triose, tetroses, pentoses, disaccharides, trisaccharides, and the sugar alcohols except for glycerol. Most notable among the other responses these strains exhibited was the utilization of the organic acids, growth at 45 C, and negative responses for the nitrate, vitamin-free growth, urease and glucose fermentation tests.

The responses of the *T. fermentans* strains were more variable than those referable to *T. capitatum* with respect to groups of carbon compounds utilized. These strains utilized L-sorbose, but failed to utilize the di- and tri-saccharides, except for cellobiose. Their responses to the sugar alcohols were variable. These strains utilized all the organic and amino acids, grew at 37 C and in the absence of vitamins, and fermented glucose. They showed neg-

ative responses to the nitrate and urease tests.

The *T. pullulans* strains were very similar in their responses to those of *T. beigelii* and were distinguished mainly by utilizing nitrate and failing to grow at 30 C. They also grew on vitamin-free medium.

The two strains of *Trichosporon aquatile* could not be distinguished from *T. beigelii*. They failed to utilize L-rhamnose and D-mannitol, but so did *T. beigelii* strain ATCC 22375. *Trichosporon* sp. strain ATCC 20187 also failed to utilize D-mannitol. *Trichosporon jerovecii* was also very similar to *T. beigelii*.

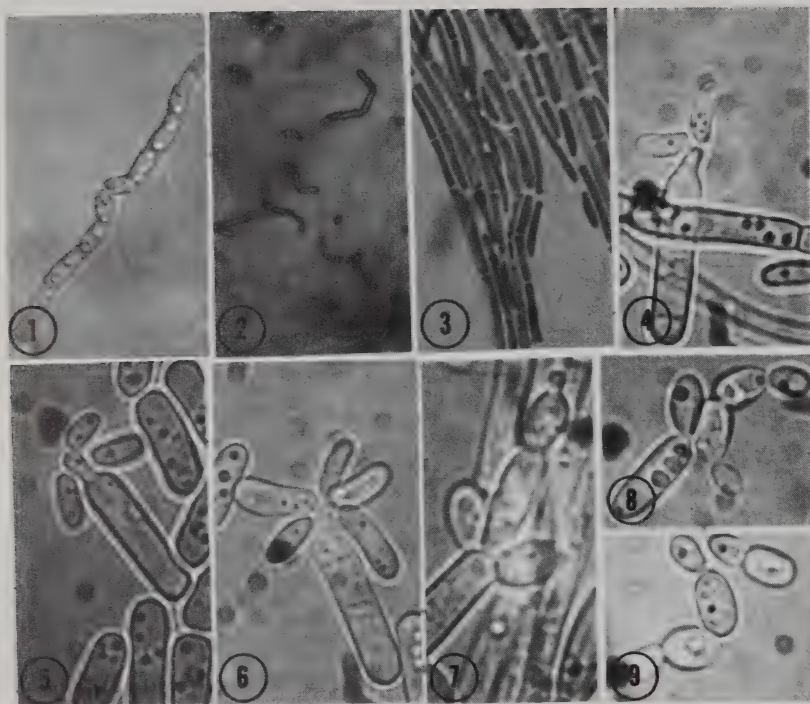
The responses of *T. erienne* were similar to *T. capitatum*. However, this strain utilized mannitol, sorbitol, salicin, and glycine. The one strain tested also splits arbutin, an ability shared by only one other strain, *T. pullulans* strain ATCC 9331. The single strain of *T. brassicae* tested failed to utilize trisaccharides and did utilize the amino acids as carbon sources; no single character separated it from all other strains.

DISCUSSION

Experimental. Regarding the morphological portion of this study, it was found that identification of arthroconidia could be effected only on solid media. In broth culture, hyphal segments as well as arthroconidia broke apart. Thus, a gradual transition over a large size range was observed and it was impossible to distinguish which of the fragments were indeed arthroconidia. The relationships of the arthroconidia in chains to the vegetative mycelium must be observed to identify them as arthroconidia. This can be accomplished only on solid media.

The unique blastoconidia of *Trichosporon capitatum* (Figs. 4-6) are unlike those of any other member of the genus. However, *Trichosporon* is probably a heterogeneous assemblage of fungi, and less confusion will result by retaining *T. capitatum* in the genus until the natural relationships of the members of this group are worked out.

There were differences from the methods of Wickerham (1951) and Lodder (1970) in the methodology that was found to be best for the fermentation and nitrogen source utili-



Figs. 1-2. Arthroconidia produced by ATCC 9331 (*Trichosporon pullulans*) from CM agar culture; 1. ca. X 560, 2. ca. X 275. Fig. 3. Arthroconidia produced by ATCC 28575 (*Trichosporon capitatum*) from Dextrose-salts agar culture (King & Jong, 1976), ca. X 560. Figs. 4-6. Blastoconidia produced by type strain ATCC 10663 of *Trichosporon capitatum* from 16 day stationary GYEP broth culture, ca. X 1,350. Fig. 7. Blastoconidia produced by type strain ATCC 10675 of *Trichosporon fermentans* from 10 day YM agar culture grown at 37 C, ca. X 1,350. Figs. 8-9. Blastoconidia-like figures produced by type strain ATCC 18019 of *Geotrichum penicillatum* (= *T. penicillatum*) from 10 day and 16 day GYEP broth culture, respectively, ca. X 1,350.

zation tests. These differences were due at least in part to the filamentous nature of *Trichosporon*.

The detection of the ability to ferment several carbon sources, including glucose and galactose, was attempted using the Durham tube technique. A small amount of gas was produced by one strain of *T. fermentans* in one of the duplicate tubes for the glucose fermentation test, and no gas was produced from any carbon source by the other strains of *T. fermentans* or the strain of *Geotrichum penicillatum* (= *T. penicillatum*). With the OF method of testing for glucose fermentation that we used, production of gas was obvious in all strains of *T. fermentans* within 2 days, and in the strain of *G. penicillatum* within 7 days.

All strains were tested for utilization of nitrogen sources (nitrate, nitrite, and ethylamine) using the method of Wickerham (1951). Using this method, there was often too much growth in the second set of tubes containing Difco Yeast Nitrogen Base (YNB) plus the nitrogen source for the test to be considered negative by strains that should not have been able to utilize the particular nitrogen source. Replacing the YNB in the second set of tubes with a simpler basal medium consisting of salts plus vitamins solved this problem satisfactorily.

The results of the physiological tests for those species examined by Carmo-Sousa (1970) were in good agreement with her results. The discrepancies were apparently due for the most part to the examination of more strains by Carmo-Sousa and thus detecting a greater degree of variation in some of the species. In a few instances, differences in methodology appeared to account for the discrepancy. This applied primarily to the utilization of organic acids as carbon sources, the tube method employed by us yielding results more similar to the auxanographic method, and to the glucose fermentation tests. Carmo-Sousa reported latent results for *T. fermentans* whereas the OF method provided rapid, obvious results.

The results for *T. aquatile* and *T. erienne* were in poor agreement with those reported by Hedrick & Dupont (1968). In the results for *T. aquatile* there were 8 discrepancies in the physiological tests and for *T. erienne* there were 5. Since our results were in close agreement with those of Carmo-Sousa (1970) on the species studied by

her, and the type strains of *T. aquatile* and *T. eriense* were examined, we choose to accept our results for these two species. The tests for which there were discrepancies, however, have been avoided in constructing the key to species.

Although Goto *et al.* (1969) reported the strain ATCC 22164 (described as *T. cutaneum* var. *antarcticum*) to split arbutin, it failed to do so in our experiments. For *T. brassicae*, our results differ from those of Nakase (1971) in the utilization of starch and citric acid, growth in vitamin-free medium and splitting of arbutin. These differences could be explained by methodology. We found growth of *T. brassicae* at 37 C to be absent whereas Nakase detected growth at this temperature.

Taxonomic. Carmo-Sousa (1970) provided a diagnosis for this genus which is generally acceptable. The primary criteria for identifying members of *Trichosporon* are the presence of true mycelium, budding cells and arthroconidia (=arthrospores). The criteria that we can add to the characterization of *Trichosporon* are that the structures are hyaline, proper criteria for the identification of arthroconidia must be observed (see introduction), and fermentative ability, when present, is not necessarily weak or latent if an appropriate method (e. g., OF) is employed.

Von Arx *et al.* (1977) recently expressed a modification of the traditional criteria by which the genera *Geotrichum* and *Trichosporon* are separated. According to their concept, members of *Geotrichum* usually lack blastoconidia and blastoconidia are usually present in members of *Trichosporon*. It is generally conceded that taxa of the Fungi Imperfecti are artificial assemblages at best, and to introduce uncertain criteria such as these to delimit the taxa only confuses current concepts in the taxonomy of this difficult group.

Throughout this paper we have referred to the type species of the genus as *Trichosporon beigelii* (Kuck. & Raben.) Vuillemin. Carmo-Sousa (1970) refers to this species as *T. cutaneum* (De Buerm. *et al.*) Ota. Carmo-Sousa notes that *T. beigelii* has priority over *T. cutaneum*, but that Diddens & Lodder (1942) designated the type species *T. cutaneum*.

Plurococcus beigelii Kuchenmeister & Rabenhorst in Rabenhorst (1867) was brought into the genus *Trichosporon* Behrend (1890) as *T. beigelii* (Kuch. & Raben.) Vuillemin (1902). The basionym of *Trichosporon cutaneum* is *Oidium cutaneum* de Beurmann *et al.* in de Beurmann & Gougerot (1909). According to Diddens & Lodder (1942), Lodder & Kreger-van Rij (1952), and Carmo-Sousa (1970) the valid publication of this species was de Beurmann, Gougerot & Vaucher, Bull. Mem. Soc. Med. Hop., Paris 28: 256, 1909. All three stated that this publication was not available. The correct citation is de Beurmann, Gougerot & Vaucher in de Beurmann & Gougerot, Mem. Soc. Med. Hop., Paris 28: 256, 1909. It should be noted, however, that de Beurmann *et al.* (1910, p. 938) definitely state they are proposing the name *Oidium cutaneum* for the fungus in question and do not cite a previous reference. *Oidium cutaneum* de Beurmann *et al.* (1909) was renamed *Mycoderma cutaneum* (de Beurmann *et al.*) Neveu-Lemaire (1921) and was subsequently brought into *Trichosporon* as *T. cutaneum* (de Beurmann *et al.*) Ota (1926).

Carmo-Sousa is mistaken in stating that the nomenclatural situation concerning the proper name for the type species of *Trichosporon* is not clear according to the International Rules for Botanical Nomenclature. This is a simple case of priority, and *T. beigelii* is the proper name for the type species. It should be noted that the reasons that Emmons *et al.* (1977) give for considering *T. beigelii* and *T. cutaneum* separate taxa (i. e., *in vivo* morphology and the diseases caused) are somewhat questionable in a taxonomic sense. However, it must also be recognized that in a taxon as cosmopolitan and heterogenous as *T. beigelii* obviously is, it may be more realistic in the future, with the advent of new data (or a different treatment of existing data), to consider this group of strains as comprising more than one taxon.

Due to the great variation exhibited by *T. beigelii*, we do not believe that recognition of varieties significantly clarifies the taxonomy of this taxon. The species that we accept in *Trichosporon* are:

Trichosporon beigelii (Kuch. & Raben.) Vuillemin,
Arch. Parasit. 5: 59. 1902.

=*Trichosporon cutaneum* (de Beurmann, Gougerot & Vaucher) Ota, Ann. Parasitol. Hum. Comp. 4: 12. 1926.

=*Trichosporon cutaneum* var. *antarcticum* Goto, Sugiyama & Iizuka, Mycologia 61: 767. 1969.

=*Trichosporon aquatile* Hedrick & DuPont, Antonie van Leeuwenhoek 34: 475. 1968.

=*Trichosporon jerovecii* Fagner, Ceska Mycol. 23: 160. 1969.

(See Carmo-Sousa, 1970, for additional synonyms).

Trichosporon brassicae Nakase, J. Gen. Appl. Microbiol. 17: 417. 1971.

Trichosporon capitatum Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 453. 1942.

(See Carmo-Sousa, 1970, for synonyms).

Trichosporon eriense Hedrick & DuPont, Antonie van Leeuwenhoek 34: 476. 1968.

Trichosporon fermentans Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 457. 1942.

(See Carmo-Sousa, 1970, for synonym).

Trichosporon pullulans (Linder) Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 410. 1942.

(See Diddens & Lodder, 1942, for synonyms).

Von Arx et al. (1977) transferred *Trichosporon capitatum*, *T. fermentans*, and *T. penicillatum* to *Geotrichum*. *Trichosporon capitatum* and *T. fermentans* produce well defined blastoconidia (Fig. 4-7) and their inclusion in *Geotrichum* is unacceptable. With *T. penicillatum* on the other hand, we have been unable to conclusively demonstrate a budding phase, although suggestive figures are quite common (e.g., Figs. 8-9). In view of the observation by Carmichael (1957) that figures suggestive of multiplication by budding are often seen in *Geotrichum candidum* although this

type of multiplication does not occur, the transfer of *T. penicillatum* to *Geotrichum* as *G. penicillatum* appears to be warranted.

In constructing a taxonomic key, it is necessary to select characters that are constant within the taxa keyed, and it is preferable to choose obvious characters. Several *Trichosporon* species are quite variable in their physiological responses, particularly *T. beigelii*, and it is difficult to select constant characters. The key of Hedrick & Dupont (1968) is unacceptable. They indicated fermentation for only *T. fermentans* and not for *G. penicillatum* (as *T. penicillatum*), attempted to separate *T. beigelii* (as *T. cutaneum*) using characters for which this species is variable and made several other mistakes that made separation of *T. pullulans* and *T. aquatile* impractical. Dennis & Buha-giar (1973) determined the assimilations of 29 carbon sources for 15 strains of *T. pullulans*. They noted variability among these strains in the assimilation of 5 carbon sources for which Carmo-Sousa (1970), who tested 13 strains, found none.

The key of Carmo-Sousa (1970) successfully separated the species considered. The only exception we have found is that one strain of *T. fermentans* (ATCC 28577) failed to utilize D-xylose. However, this key depends on the presence or absence of single characters in the individual couplets. Fungi are notoriously mutable, and the failure to utilize any one of a few compounds could make it impossible to identify a strain that was indeed little different from other strains of the appropriate species.

The synoptic key outlined by Korf (1972) appears to reduce the problems of identification presented by the possibility of mutation, or simply an uncharacteristic strain, provided a sufficient number of characters are used. The following key has therefore been constructed to separate the recognized species of *Trichosporon*. In the key the numbers refer to (1) *T. beigelii*, (2) *T. capitatum*, (3) *T. fermentans*, (4) *T. pullulans*, (5) *T. ericense*, (6) *T. brassicae*. A species number following a character indicates that the species is positive for that character. An underlined species number indicates that the species may be either positive or negative for that character.

A. Fermentation of glucose	3
B. Utilization of nitrate	4
C. Urease activity	<u>1</u> , 4, 6
D. Lactose assimilation	1, 4
E. α -Methyl-D-glucoside assimilation	<u>1</u> , 4
F. Ribitol (adonitol) assimilation	<u>1</u> , 3, <u>4</u> , 6
G. Cellobiose assimilation	<u>1</u> , 3, 4, 5
H. Salicin assimilation	<u>1</u> , 3, 4, 5
I. Vitamin-free growth	<u>1</u> , 3, 4, 6
J. D-mannitol assimilation	<u>1</u> , 3, 4, 5, 6
K. L-arginine assimilation (as carbon)	<u>1</u> , <u>2</u> , 3, 5, 6

We agree with the exclusions from the genus proposed by Carmo-Sousa (1970). The species we do not accept in the genus that were considered by her and that have been described since her treatment of the genus are listed below.

Trichosporon aculeatum Phaff *et al.*, Antonie van Leeuwenhoek 22: 160. 1956.

=*Aciculoconidium aculeatum* King & Jong, Mycotaxon 3: 407. 1976.

Trichosporon arenicola Lima & Quieroz, Publicacao Inst. Micol. Recife No. 690: 2. 1972.

=*Candida* sp. (based on the type strain ATCC 32301).

Trichosporon fennicum Sonck & Yarrow, Antonie van Leeuwenhoek 35: 174. 1969.

=*Candida* sp. (based on the type strain ATCC 18895).

Trichosporon inkin (Oho) Carmo-Sousa & van Uden, Mycologia 59: 653. 1967.

=*Sarcinosporon inkin* (Oho) King & Jong, Mycotaxon 3: 93. 1975.

Trichosporon melibiosaceum Scott & van der Walt,
Antonie van Leeuwenhoek 36: 393. 1970.

=*Candida* sp. (based on the type strain ATCC 28580
and strain ATCC 28681).

Trichosporon oryzae Ito *et al.*, Agric. Biol. Chem.
38: 1599. 1974.

=*Candida edax* van der Walt & Nel, 1968 (Jong
and King, 1977).

Trichosporon penicillatum Carmo-Sousa, Antonie van
Leeuwenhoek 31: 153. 1965.

=*Geotrichum penicillatum* von Arx *et al.*, CBS
Studies in Mycology No. 14. 1977.

A new combination to accommodate *Trichosporon hellenicum* is proposed.

Candida hellenica, comb. nov.

=*Trichosporon hellenicum* Verona & Picci, Ann.
Microbiol. Enzim. Univ. Pisa 8: 106. 1958.

Based on the type strain ATCC 15542 and strain ATCC
28579, *Candida hellenica* has the following profile:

Fermentation:

Glucose	+	Sucrose	+
Galactose	+	Lactose	-
Maltose	-	Cellobiose	+

Carbon Assimilation:

Glucose	+	D-Glucosamine	+
Galactose	+	Ethanol	+
L-Sorbose	+	Glycerol	+
Sucrose	+	i-Erythritol	-
Maltose	+	Adonitol (Ribitol)	+
Cellobiose	+	Dulcitol (Galactitol)	+
Trehalose	+	D-Mannitol	+
Lactose	-	D-Sorbitol (Glucitol)	+
Melibiose	-	α -Methyl-D-Glucoside	+

Raffinose	+	Salicin	+
Melezitose	+	Inositol	+
Inulin	-	DL-Lactic Acid	-
Starch	+	Citric Acid	+
D-Xylose	+	Succinic Acid	+
L-Arabinose	+	L-Valine	+
D-Arabinose	-	Glycine	-
D-Ribose	+	L-Proline	+
L-Rhamnose	+	L-Arginine	+

Other Tests:

Assimilation of KNO_3	-
Assimilation of NaNO_2	-
Assimilation of Ethylamine HCl	+
Growth in Vitamin-Free Medium	-
Growth at 37 C	+
Growth at 45 C	-
Hydrolysis of Urea	-
Splitting of Arbutin	+

In spite of attempts to obtain cultures of the type strains of the following species, cultures were not available for this study:

- Trichosporon luchetti* Redaelli & Ciferri, 1941.
Trichosporon intermedium Florenzano, 1950.
Trichosporon merulioides Kobayashi, 1953.
Trichosporon neofermentans Kobayashi, 1953.
Trichosporon yamanashiensis Yokotsuka & Goto, 1955.
Trichosporon terrestre van der Walt & Johannsen, 1975.

ACKNOWLEDGMENTS

This work was supported in part by the Brown-Hazen Grant BH 846 from Research Corporation, New York.

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MYCOTAXON

Vol. VI, No. 2, pp. 418-420

October-December 1977

NOTES ON ARACHNOPEZIZA FITZPATRICKII AND A. RHOPALOSTYLIDIS

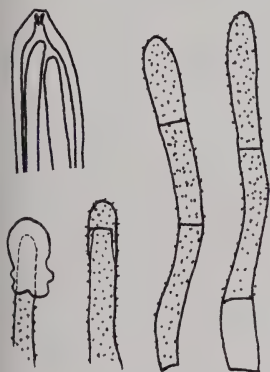
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The first Discomycete which I described as "new to science" was *Arachnopeziza fitzpatrickii* Korf (1952), known from a single collection which I had obtained on old wood in Coy Glen, Ithaca, New York, on May 15, 1947. The total collection consisted of about 20 apothecia, each well under a millimeter in diameter, on an obvious subiculum covering the wood. The species is so distinctive in its possession of a toothed margin composed of agglutinated, fasciculate hairs that I had no difficulty in recognizing it as undescribed. Though I returned frequently to Coy Glen and the same log to search for more material, I never found it again, and determined to describe it from the one collection. In the ensuing quarter century the type locality has been inundated by perhaps a meter of gravel from a major gravel-digging operation just above the site, and my hopes of ever seeing the species again dimmed perceptibly.

In 1975 my student, Martha A. Sherwood, called to my attention her collection No. 2127, on wood of a decorticated tree, collected in a *Kalmia* woods, in Alleghany National Forest, about 2 miles east of Heart's Content, Pennsylvania, on October 18, 1975, which she had correctly identified as *A. fitzpatrickii*. This is a huge collection of several hundred apothecia, part of which is deposited in CUP 54718, and part of which is being distributed as duplicates to FH, K, and NY. This second collection extends not only the geographical and seasonal ranges, but allows modification of the original diagnosis. No apothecia exceed the size (300-600 μm diam) originally reported, but many have fewer fascicles (perhaps 10, compared to the more than 30 on the apothecium photographed and illustrated originally), and the fascicles may consist of many more than the 10 or so hyphae reported. The ascospores in the original description are given as 13.6-22.5 $\times$ 2.7-4.8 μm , while I measure those of this collection to be 12.4-15.4 (-21.2) $\times$ 2.9-3.3 (-4.0) μm .

Recently Dr. John H. Haines, New York State Museum, called to my attention a collection taken by S. J. Hughes on 8. V. 1963 of *Arachnopeziza rhopalostylidis* Dennis (1961). Like the type specimen, it was collected on dead leaves of *Rhopalostylis sapida*, a palm, and the specimen (DAOM 156811) was obtained near the type locality, at Waiatarua, Waitakere Range, Auckland Province, New Zealand. It is unquestionably the species described by Dennis, and has densely gregarious apothecia totally devoid of a subiculum, with filiform ascospores that remain non-septate for a long time (but, as shown to me by Dr. Haines, eventually develop 1-3 septa). Dennis drew smooth hairs, but they are distinctly finely granulate; some are thick-walled apically, others not; some are tipped



by a resinous material (FIG. 1). The thick-walled asci have a tapering, J+ pore-wall (Dennis wrote, "apice ultimo obsolete jodo coerulescente") (FIG. 1). Significantly, the hyphae of the ascocarp are all long-celled and glassy-walled, bound in a gel (except for the loose hairs). This is no *Arachnopeziza*, and the species must even fall outside of the *Hyaloscyphoideae*. It fits rather well within the concept of the *Trichoscyphelloideae* (Korf, 1973), and since it differs only in minor respects from species I now range in *Lachnellula* Karst. emend. Dennis (inclusive of *Trichoscyphella* Nannf.) I propose its transfer:

FIG. 1. Ascus apex, *LACHNELLULA RHOPALOSTYLIDIS* (Dennis) Korf, *comb. nov.*

Basionym: *Arachnopeziza rhopalostylidis* Dennis, Kew Bull. 15: 302. 1961.

Assignment of Dennis's species to *Lachnellula* is in keeping with the current, broad concept of the genus, no longer restricted to spherical-spored species such as *L. chrysophthalma* ("Pers.") Karst. [= *L. suecica* (Fuckel) Nannf. in Lund. & Nannf.], but with the oval-spored and filiform-spored species previously treated as members of *Trichoscyphella*. This emendation by Dennis (1962) has been followed by such workers as Dharne (1965) and Raïtviir (1970). In its earlier, more restricted sense, the species assigned to the genus were normally on coniferous hosts, but in its broader delimitation, hosts of many families occur. Whether such anomalous species as *L. theiodea* (Cke. & Ell.) Sacc. (cfr. Korf, 1962) can

still be accommodated in the genus is open to serious doubt (Dennis, Dharne, and Raïtviir, *loc. cit.*, all fail to mention this species). But quite clearly an interface exists between the Trichoscyphelloideae (with its one genus, *Lachnellula*) and species that have been placed in the Phialeoidae, particularly in such genera as *Cyathicula* (inclusive of "*Phialea*," *cfr.* Dumont & Korf, 1977) and *Belonioscypha*, on the one hand, and species still ranged in *Dasyscyphus* (in its broad sense) on the other. Whether *L. rhopalostylidis* needs to be segregated into some as yet undescribed genus will have to wait for further data. Information on tropical members of the Hyaloscyphaceae currently being undertaken by Dr. Haines should throw light on affinities in this group. But clearly the species cannot be accommodated in *Arachnopeziza*, and its transfer out of the genus now at least calls attention to its probable relatives.

ACKNOWLEDGEMENTS

I wish to thank Susan M. Gruff and Robert Dirig for technical assistance, and Drs. Sherwood and Haines for calling the specimens to my attention. Financial support of National Science Foundation grant DEB75-23557 is gratefully acknowledged.

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MYCOTAXON

AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION
OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS

Vol. VI

January-March 1978

No. 3

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[MYCOTAXON for October-December 1977 (6: 213-420)
was issued November 4, 1977]

ISSN 0093-4666 MYXNAE 6(3) 421-526 (1978)

Library of Congress Catalogue Card Number 74-7903

Published quarterly by MYCOTAXON, Ltd., P.O. Box 264, Ithaca NY 14850
For subscription details, see back cover

MYCOTAXON

Vol. VI, No. 3, pp. 421-456

January-March 1978

THE GENUS SPHACELOTHECA (USTILAGINALES): CRITERIA FOR ITS DELIMITATION AND THE CONSEQUENCES THEREOF

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SUMMARY

The characteristics of *Sphacelotheca hydro-piperis* have been defined and criteria for the genus *Sphacelotheca* established. That genus is valid for some smuts of Polygonaceae. Studies of the ontogeny and mature structure of sori of *Sphacelotheca sorghi* and some other smuts of Poaceae currently included in *Sphacelotheca* have shown that these are markedly different from the type species of *Sphacelotheca* and should not be included in that genus. *Sporisorium*, a genus based on *Sporisorium sorghi* on *Sorghum*, is available for certain smuts previously placed in *Sphacelotheca*.

De Bary (1884) erected the genus *Sphacelotheca* de Bary to accommodate *Ustilago hydropiperis* (Schum.) Schrot. (*Uredo hydropiperis* Schum.), a smut of *Polygonum hydropiper* L. He observed that while the sori of some other smuts such as *Sorosporium saponariae* Rudolphi and *Ustilago hypodytes* (Schlecht.) Fr. consisted only of spores, *Ustilago hydropiperis* had a distinctly differentiated spore-receptacle. He described the sorus as having a thick outer wall of small, round, hyaline cells, an axile columella composed of cells similar to the outer wall and a dark spore mass lying between the columella and the sorus wall.

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De Bary gave a short description of sorus ontogeny in *Sphacelotheca hydropiperis* (Schum.) de Bary. We quote from the authorised English translation (de Bary, 1887) his description of how the peridium, columella and spores originate: '... each of these three portions grows from its base by addition of new tissue-elements, which are constantly being produced and pushed onwards from the basal formative tissue, and are differentiated and assume their ultimate form in the order in which they are produced.'

Many mycologists have failed to appreciate the significance of de Bary's data. There has been confusion and conflict of opinion about the limits of the genus *Sphacelotheca* and even its validity. Prillieux (1895) investigated the structure of sori of a smut of *Sorghum*, *Ustilago sorghi* Pass. and noted gross similarities of sorus structure between that smut and *Sphacelotheca hydropiperis*. He rejected the notion that the sorghum smut was possibly a species of *Sphacelotheca* because the anatomy of its columella differed greatly from that of *S. hydropiperis*. Dietel (1900) noted that de Bary had proposed a genus, *Sphacelotheca*, based on *S. hydropiperis*, but he still listed that smut as a species of *Ustilago*. Later Dietel (1928) accepted *Sphacelotheca* and remarked that some species of smuts on grasses had been included in it. Probably he was influenced by Clinton (1902, 1904) who had altered the diagnosis of *Sphacelotheca* in order to justify the inclusion in that genus of some smuts of the Poaceae whose sori had a fungal peridium, sterile cells among the spores, and apparent centripetal development of spores around a columella. Clinton knew of Prillieux's (1895) work and included the latter's paper in an annotated list of references to smut fungi (Clinton, 1904). Nevertheless he proceeded with the transfer of some graminicolous smuts to *Sphacelotheca*. Among them were two well known smuts of *Sorghum* spp., namely *Sporisorium sorghi* Ehrenb. and *Ustilago reiliana* Kühn.

Many species of graminicolous smuts have been placed in *Sphacelotheca* since Clinton's time. Fischer & Holton (1957), in their census of smuts on various hosts, recorded 123 species of *Sphacelotheca* on Poaceae out of a total of 137 on all hosts.

Some mycologists have accepted *Sphacelotheca* sensu Clinton tacitly, by describing species within that genus or reluctantly, as did Schellenberg (1911), who remarked that

he did so as a matter of expediency because relationships between *Ustilago* and *Sphacelotheca* were still to be resolved. Liro (1924) accepted *Sphacelotheca* for certain smuts of *Polygonum* spp. He suggested that further work was necessary before it could be certain that the transfer of certain graminicolous smuts to *Sphacelotheca* by Clinton and other authors was justifiable. Fischer (1953) and Fischer & Holton (1957) supported retention of *Sphacelotheca*, considering that the fungal peridium and basipetal formation of spores around a columella were characters sufficient to make it distinct from *Ustilago*. Other mycologists have not been favourable to acceptance of *Sphacelotheca*. McAlpine (1910) and Hirschhorn (1939) rejected *Sphacelotheca*, retaining the *Polygonum* smut in *Ustilago*. They did not consider the fungal peridium and columella to have generic value. McAlpine included in *Cintractia* a number of smuts which might have been placed in *Sphacelotheca* if he had accepted Clinton's (1902) opinion. Hirschhorn too favoured *Ustilago* and *Cintractia* for the disposition of certain smuts which in 1939 were included in *Sphacelotheca*. Savile (1953) looked on *Sphacelotheca* as a doubtful genus and suggested that it was a polyphyletic outgrowth from *Ustilago*. Nannfeldt (1959) rejected *Sphacelotheca*, believing that the species assigned to it had strong affinities with *Ustilago*.

Because de Bary's (1884) criteria for *Sphacelotheca* were altered by Clinton (1902) there are strong grounds for believing that smuts with characteristics very different from those by which de Bary recognised *Sphacelotheca* may at present be included in that genus. It is clear that the doubts and controversies concerning *Sphacelotheca* as a genus of smut fungi will not be resolved without new evidence being brought forward. Therefore specimens of some species of *Sphacelotheca* on Polygonaceae and Poaceae have been examined. New data on sorus ontogeny and the structure of mature sori of certain species of smuts are presented in this paper. The impact of these data on the taxonomy and nomenclature of smuts currently accepted as species of *Sphacelotheca* has then been considered.

SPHACELOTHECA SPP. ON POLYGONACEAE

De Bary's (1884) short account of *Sphacelotheca hydro-piperis* was confirmed and extended by Liro (1924). His important contribution was the observation that the spores are at first catenulate and separated by 'hyphenfragmenten'.

The latter are now referred to as disjunctors. Liro (1924) thought that Bubak, in 1912, had been the first to depict these structures, but illustrations by McAlpine (1910) show disjunctors associated with the spores. Neither Bubak (fide Liro (1924)) nor McAlpine mention disjunctors in their writings. Ciferri's (1938) statement that very small (1 - 4 μm , often 2 μm diam.), round to elongate sterile cells were mixed with spores of *S. hydropiperis* could possibly refer to disjunctors.

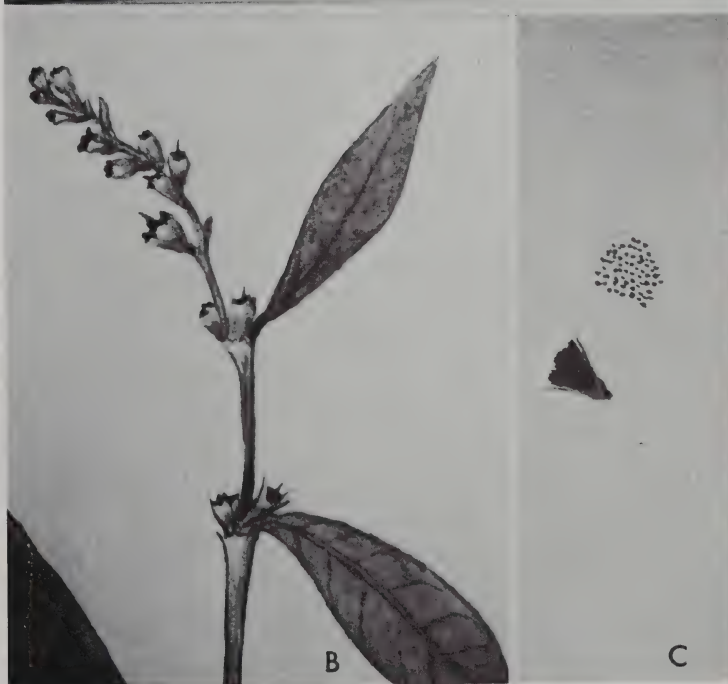
Specimens of some *Sphacelotheca* spp. on *Polygonum* spp. have been studied. One purpose was to determine whether soral characters consistent with those enumerated by de Bary when he erected the genus *Sphacelotheca* were in evidence. The other was to examine the accuracy of de Bary's account of sorus ontogeny. Because some authors (McAlpine, 1910; Hirschhorn, 1939; Savile, 1953) have considered that *Sphacelotheca* is not separable from *Ustilago*, some species of *Ustilago* on *Polygonum* spp. have been included for comparison with species which have been placed in *Sphacelotheca*.

Materials and methods

Schumacher's specimen of *Uredo hydropiperis* is no longer extant (H. Knudsen, private communication). Evidence of the structure of that fungus is provided by drawings, with annotation, by C.F. Schumacher, in *Flora Hafniensis, Fungi Delineati* (Fig. 1). That work, executed in about 1800, was never published. The manuscript is held now in the Botanical Central Library, University of Copenhagen. The following specimens of *Sphacelotheca* spp. and *Ustilago* spp. on *Polygonum* spp., listed by the names under which they were received, have been examined. Their taxonomy at the species level has not been analysed.

Sphacelotheca hydropiperis (Schum.) de Bary. On *Polygonum hydropiper* L.: Denmark, 18 Aug. 1878, E. Rostrup (C); Denmark 18 Oct. 1874, E. Rostrup (C); Denmark, 26 Sept. 1908, A. Lange (C); Denmark, 10 Sept. 1899, J. Jespersen (C); Germany, Sydow, *Ustilagineen*, no. 68, 12 Aug. 1894, P. Hennings (VPRI); Romania, 3 Sept. 1964, K. Vanky (DAR

Figure 1. *Sphacelotheca hydropiperis*. (A) Schumacher's drawing of *S. hydropiperis* in *Flora Hafniensis, Fungi Delineati* (unpublished); (B) and (C) enlargements of portions of (A).



23705); Britain, 1 Sept. 1940, G.C. Ainsworth (IMI 32365). On *Polygonum sagittatum* L. U.S.A., Sept. 1907, A.B. & F.C. Seymour (DAR 11101); U.S.A., 8 Sept. 1954, F.C. Greene (DAR 15368). On *Polygonum bistorta* L. Manchuria, 7 June 1925, P.H. Dorsett (DAR 11100). On *Polygonum* sp. Indonesia, 12 Apr. 1936, W.J. Lütjeharms (DAR 14835). *Sphacelotheca borealis* (Clint.) Schellenb. On *Polygonum bistorta* L. Switzerland, no date, H. Schinz (Krypt. exsicc. Vindob. 2003, duplicate as DAR 25976). *Sphacelotheca tropico-africana* Zundel on *Polygonum* sp. Congo, Africa, 16 Feb., 1927, D.H. Linder (TYPE, BPI). *Sphacelotheca* sp. On *Polygonum decipiens* R.Br. N.S.W., Australia, 14 Sept., 1969, J. Walker (DAR 19169); South Australia, 9 May, 1959, L.D. Williams (DAR 20450). *Ustilago bistortarum* (DC) Korn. On *Polygonum viviparum* L. Canada, 1 Aug., 1950, D.B.O. Savile & C.T. Watts No. 1232 (DAR 16106). *Ustilago anomala* Kunze. On *Polygonum hydropiper* L. Queensland, 10 April, 1976, R.F.N. Langdon (DAR 27755).

Each specimen was compared with Schumacher's illustrations of the whole sorus. Some sori were dissected manually and others were sectioned with a freezing microtome, both transversely and vertically. For microscopic examination material was mounted in lactophenol and stained with either cotton blue or acid fuchsin. Sori of *Ustilago anomala* Kunze of which living material was available were sectioned after embedding in wax.

Observations and interpretation

All of the specimens listed above as species of *Sphacelotheca* had the macroscopic features of *S. hydropiperis* as depicted by Schumacher. In all specimens except DAR 11100 spores in chains, with disjunctors, were found when basal regions of young sori were examined. The sori of specimen DAR 11100 were mature with most of the spores eroded from them. The remaining spores were separate from one another. Only a few with disjunctors attached were found. Some disjunctors remnants lay free in the slide mount. In all specimens, every sorus had a peridium and columella composed of hyaline, thick-walled cells. Spores still in chains were somewhat flattened where they were joined to adjacent spores by disjunctors. Mature spores which had disarticulated were subglobose and many no longer had disjunctors attached to them. In all specimens the columella was per-

sistent and protruded well beyond the eroded spore mass in many sori. The length of the columella in many cases exceeded by several millimetres the length of the fruits of the host. Evidently growth of the sorus is indeterminate and ceases only when floral parts senesce. The columella, except at its base, is free of admixture with host tissues. Only remnants of the funicle and ovule are included there and the greater part of the columella is composed of fungal cells pushed upwards past the stub of host tissue. The peridium, more fragile than the columella, is often eroded together with the spore mass as the sorus elongates. All specimens had the characters which de Bary (1884) gave as the criteria for *Sphacelotheca*. *S. austro-africana*, described by Zundel (1944) as destroying the inflorescence, does not involve the whole inflorescence in a single sorus. The sori are in individual flowers as is the case with the other species of *Sphacelotheca* on *Polygonum* species which have been examined. There were sufficient differences in spore ornamentation in some of the specimens to indicate that there is more than one species of *Sphacelotheca* on *Polygonum* species.

The specimen of *Ustilago bistortarum* examined is part of a collection which led Savile (1953) to comment on the possible invalidity of *Sphacelotheca* as a genus. The smut is a species of *Ustilago* as that genus was defined by Langdon & Fullerton (1975). It lacks a peridium and resembles species of *Sphacelotheca* only by its having dark, elongated bodies resembling columellae associated with the sori. They are mummified staminal filaments. Similar structures occur in some of the sori of *Ustilago anomala* from Australia. A study of the latter's sori confirmed that it is truly an *Ustilago*.

After a study of specimens which were received as *Sphacelotheca hydropiperis* and which conformed to descriptions of that species, the following account of *S. hydropiperis* has been prepared. Observations on the other species of *Sphacelotheca* showed that the ontogeny and the mature form of the sori were the same as that of *S. hydropiperis*, apart from minor differences significant only at the species level.

Sphacelotheca hydropiperis: Around small sori about 2 mm long the pericarp may be intact and still surmounted by the style. In the apical parts of larger, older sori the peridium and overlying tissues of the pericarp break up, exp-

osing the spore mass and columella. The components of the sorus develop from hyphae in the receptacle close to the base of the ovary. Hyphal walls gelatinize and the protoplasts differentiate as hyaline cells, which constitute the peridium and columella, or as dark spores (Fig. 2; A). From the soral meristem some of the cells are pushed outwards and upwards, lining the enlarging pericarp and forming the soral peridium. Others are pushed upwards to form the columella, a structure which at its base includes degraded vascular and other tissues, these being remnants of the funicle and the basal orthotropous ovule. Above the distal limits of host tissue the columella is composed only of hyaline, thick-walled, subglobose cells similar to those of the peridium. Between the columella and the peridium are spores, packed closely together but readily separable from one another. There is no gradation in maturity of spores between the columella and the peridium, nor are there any hyaline cells or hyphae in the spore mass. Continual hyphal growth adds cells to those formed first and which are pushed upwards as the sorus enlarges. Spores and the cells of the peridium and columella are formed in ascendant, sinuous, intertwined chains with disjunctors between the cells. Disjunctors are readily seen in chains of spores taken from the base of a sorus (Fig. 2; B, C) but have disappeared from many of the mature spores taken from the upper part of the sorus (Fig. 2; D). Distorted remnants of the disjunctors persist among columellar and peridial cells.

Discussion

Sorus ontogeny and characteristics of the mature sorus of *Sphacelotheca hydropiperis*, the type species of *Sphacelotheca*, have been elucidated. Now criteria for that controversial genus can be defined. Sori are bounded by a fungal peridium of hyaline cells overlying which are tissues of the ovary wall. Dark spores are formed in ascendant chains with disjunctors between the spores. The columella is formed of cells similar to those of the peridium. The components of the sorus develop from mycelium located in host tissue at the base of the sorus.

Sphacelotheca has sometimes been placed in synonymy with *Ustilago*. That action has never been based on critical, comparative studies. Hirschhorn (1939) reviewed the opinions of several authors on the status of *Sphacelotheca*

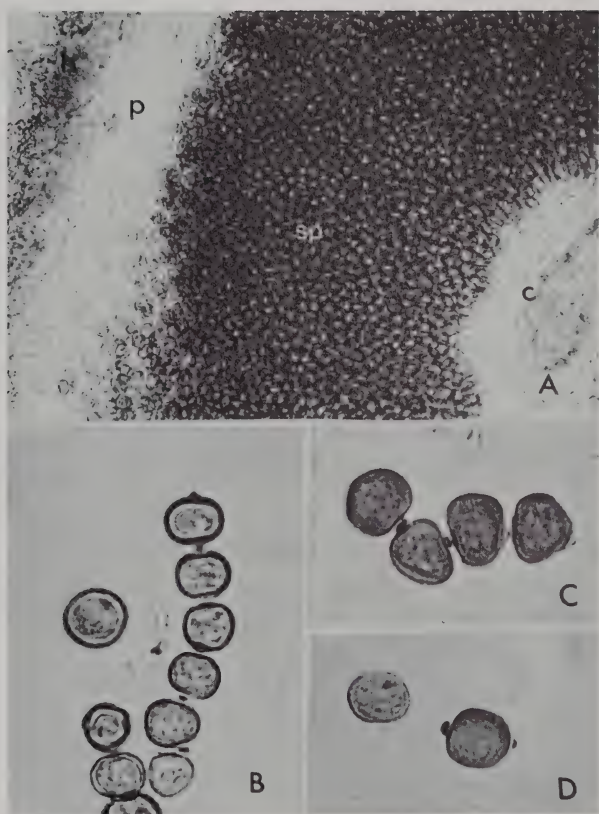


Figure 2. *Sphacelotheca hydropiperis*. (A) transverse section of sorus near base (x200). h, host tissue (pericarp); p, fungal peridium; sp, spores; c, columella with an inclusion of host tissues. (B) immature spores, catenulate and separated by disjunctors (x1000). (C) spores, near maturity (x1000). (D) mature spores (x1000).

in her report on some smuts from the Argentine. She concluded that the peridium and the columella should be rejected as generic characters because they are structures common to several genera. Noting that in species of *Ustilago* and *Sphacelotheca* the spores are separate from one another, she placed two species of *Sphacelotheca* (including *S. hydropiperis*) in *Ustilago* and one (*S. sorghi*) in *Cintractia*. She accepted agglutination of the spores as characterising *Cintractia*, even though mature spores are readily separable from one another. Rejection of the columella as a generic character is not warranted. Langdon & Fullerton (1975) have studied the origin and structure of the columella in sori of some graminicolous species of *Sorosporium*. The columella in those species is very different in structure and function from the columella of species of *Sphacelotheca*. The columellae in the two genera are not homologous structures. Sporogenesis in *Ustilago* (Langdon & Fullerton, 1975) differs from that of *Sphacelotheca*. A common end point, spores separate from one another, does not justify placing *Sphacelotheca* in synonymy with *Ustilago*.

Doubts concerning *Sphacelotheca* as an acceptable genus have been dispelled. Consideration of the ontogeny of the soral components makes it clear that the peridium and columella are constant features of the sorus. They differ morphologically from analogous structures in some other genera. The spores, developing in chains with disjunctors, provide a distinctive character to ally with the columella and peridium as criteria for delimiting *Sphacelotheca*. We conclude that *Sphacelotheca* is soundly based and that some species of smuts of the Polygonaceae are correctly placed in that genus.

SPHACELOTHECA SPP. ON POACEAE

It is necessary to resolve whether certain smuts of the Poaceae are congeneric with the species of *Sphacelotheca* on Polygonaceae. Therefore sorus ontogeny and sporogenesis of four graminicolous smuts currently included in *Sphacelotheca* have been investigated. Those matters can then be considered in relation to the components of mature sori. A basis for an appreciation of the taxonomic position of these graminicolous smuts will then be available.

Materials and methods

The smuts studied and their respective hosts were as follows: *Sphacelotheca sorghi* (Link) Clint. on *Sorghum leiocladum* (Hack.) Hubb., *S. andropogonis* (Opiz) Bubak on *Bothriochloa bladhii* (Retz) S.T. Blake, *S. amphiphys* Syd. on *Bothriochloa decipiens* (Hack.) Hubb. and *S. vanderystii* (P.Henn.) Ling on *Hyparrhenia filipendula* (Hochst.) Stapf. The hosts are indigenous, perennial grasses of tropical and subtropical Queensland. In each the smut fungus is systemic. Naturally infected plants were transplanted from the countryside to garden beds at the University of Queensland where they were maintained as sources of smut sori.

The methods and techniques used in light and transmission electron microscope studies were the same as those described previously (Langdon & Fullerton, 1975). For observation of spore surfaces with a scanning electron microscope, spores from mature sori were fixed to stubs with double adhesive tape and coated with gold.

Observations and interpretation

Sphacelotheca sorghi

The inflorescence of *Sorghum leiocladum* is a panicle with spikelets in pairs, one sessile and the other pedicellate. In the sessile spikelet the lower floret is reduced to a lemma and the upper floret is hermaphrodite. The pedicellate spikelet is similar except that the upper floret is male. Sori form in both hermaphrodite and male florets. A mature sorus is subglobose to elongate, up to 3mm long (Fig. 3; A). Spores are slightly agglutinated and among them lie chains or groups of thick-walled, hyaline cells. There is a central columella composed of hyphae and host tissues and a peridium consisting of a hyphal sheath overlain by several layers of host cells.

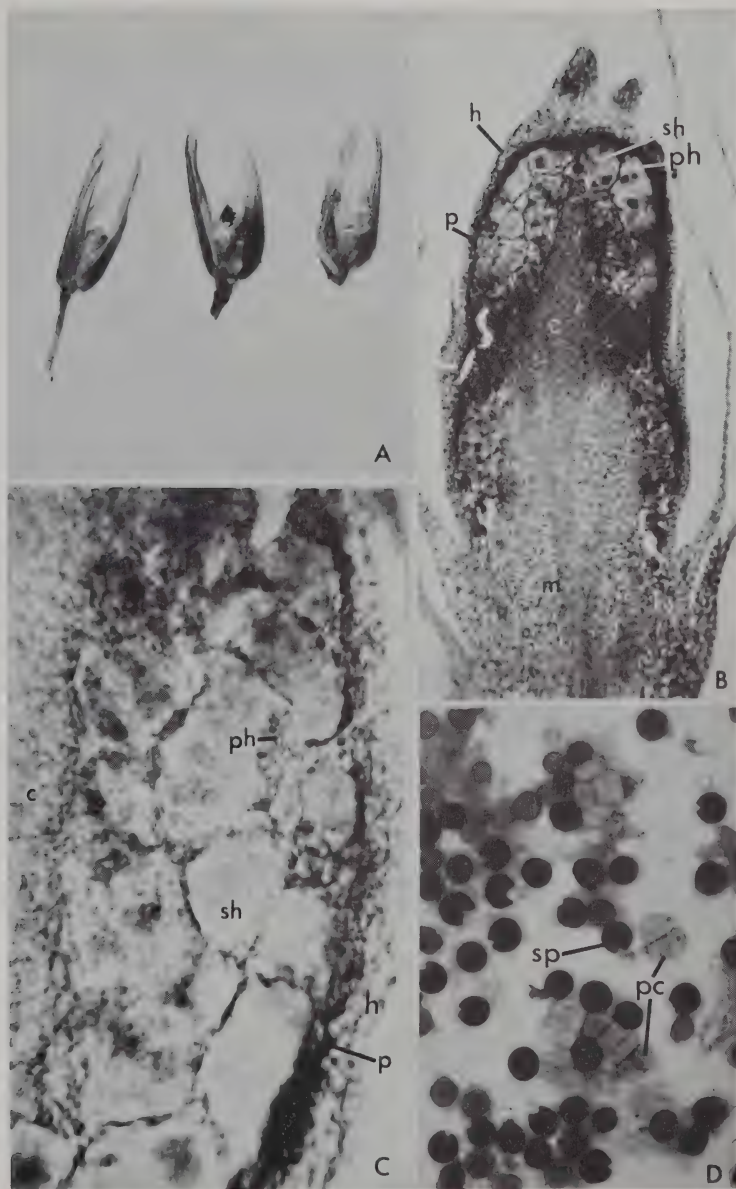
While tillers are in a vegetative state mycelium remains in juvenile tissues below the growing point. After flower initiation hyphae occupy positions close to the growing points of the panicle branches. Hyphae grow into spikelet primordia when the latter are less than 0.5 mm long, massing in each spikelet axis close to the level of the glume primordia. The particular position of this pocket of hyphae determines whether the lower floret is in-

cluded in the sorus or remains free. Glumes develop normally. Ovary primordia are seldom developed in hermaphrodite florets invaded by hyphae. Primordia of other floret structures have no further development after sorus initiation and their remnants remain at the apex of the sorus as it develops. A host meristem is initiated in the axis of the spiklet just below the pocket of hyphae. The sorus, a complex of host tissue and hyphae (Fig. 3; B), then develops by the contemporaneous growth of host and fungus.

Intercellular hyphae circumjacent to the periphery of a cell mass formed by the host meristem become confluent, separating a layer two or three cells deep from the central group of cells. Continual proliferation of host cells provides a columella, where parenchyma and vascular elements are differentiated, and layers of parenchymatous cells which invest the developing sorus. Contemporaneously with the development of new host tissues, hyphae close to the peripheral host cells form a sheath of elongate, thick-walled, vacuolate cells. Other hyphae grow inter- and intracellularly with tissues of the columella. Hyphae close to the host meristem increase in quantity and at the same time hyphae grow from the developing columella towards the peridium. In this mass of hyphae subglobose pockets of intertwined hyphae, which soon become sporogenous, are separated by a network of long-celled, non-sporogenous hyphae. The latter we term *partitioning hyphae* (Fig. 3; B, C).

The walls of sporogenous hyphae gelatinize and protoplasts swell and become subglobose. Karyogamy sometimes occurs before wall gelatinization is complete, sometimes while the protoplasts are enlarging. Spines are first evident when the spores are about 2 μm diam. When the spores are 6 μm diam. the first-formed spines are 0.8 μm long and a second series of spines up to 0.4 μm long has developed (Fig. 4). The secondary spines are more numerous than the primary spines (Fig. 5). They develop between and also

Figure 3. *Sphacelotheca sorghi*. (A) spikelets with sori (x4.5). (B) longitudinal section of young sorus (x75). m, soral meristem; h, host tissue overlying fungal peridium; p, fungal peridium; c, columella; sh, pocket of sporogenous hyphae; ph, partitioning hyphae. (C) detail of part of (B) (x225). h, host tissue overlying fungal peridium; p, fungal peridium; c, columella; sh, sporogenous hyphae; ph, partitioning hyphae. (D) spores (sp) and partitioning cells (pc) from a mature sorus (x550).



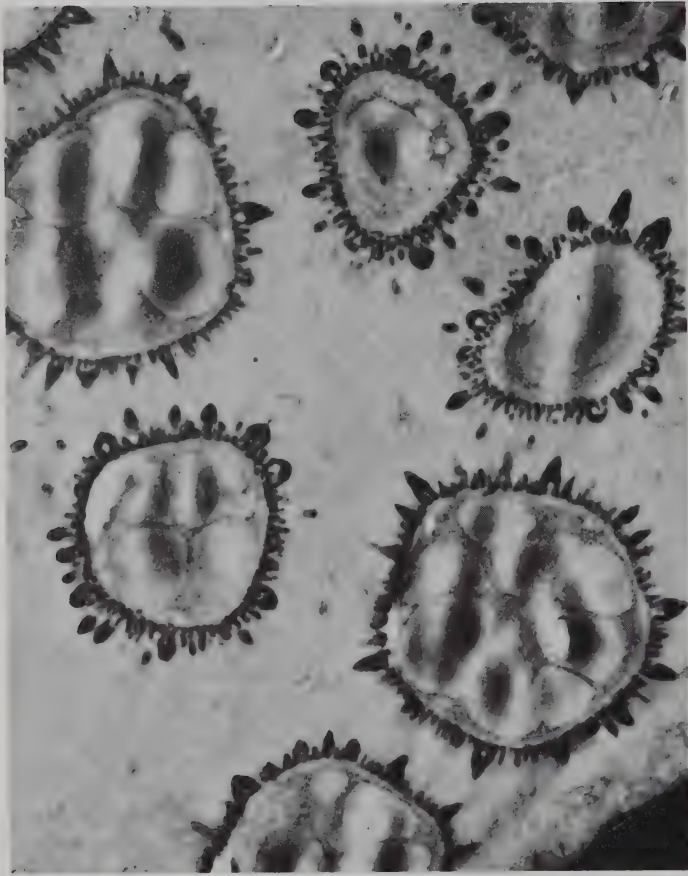


Figure 4. *Sphacelotheca sorghi*. Section through spores showing primary and secondary spines (x7000).

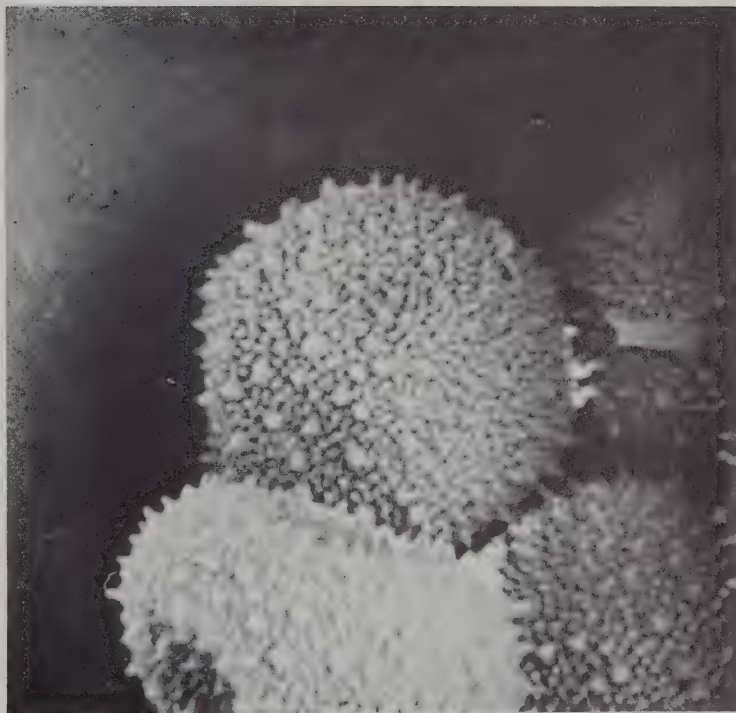


Figure 5. *Sphacelotheca sorghi*. Surface view of spores showing primary and secondary spines (x5400).

beneath the primary spines. In the latter position one to several secondary spines develop after apparent erosion of the spine base. The distal portions of primary spines remain intact. Lipid bodies are present in young spores and they enlarge as spores increase in size. As spores approach maturity their walls become pigmented. By then all of the gelatinous matrix has disappeared.

While sporogenous hyphae are forming spores the partitioning hyphae are modified. Single cells or several adjacent cells divide and enlarge, producing chains or irregular clumps of hyaline cells with smooth, thick walls. Each cell has a thin peripheral layer of cytoplasm, a nucleus and a large vacuole. We call these cells *partitioning cells* (Fig. 3; D).

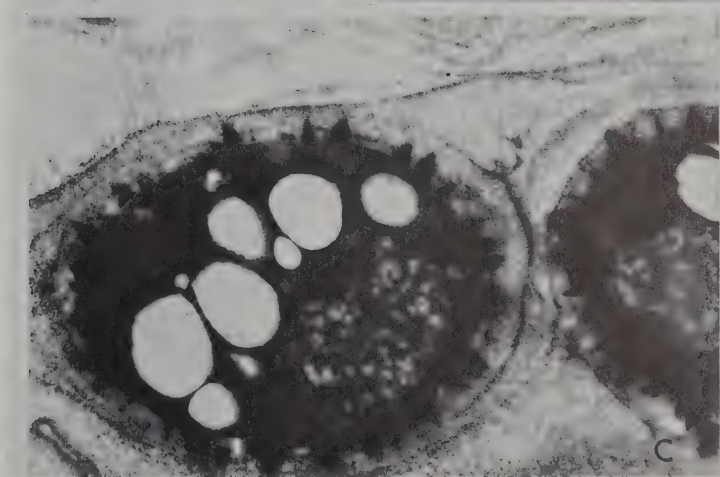
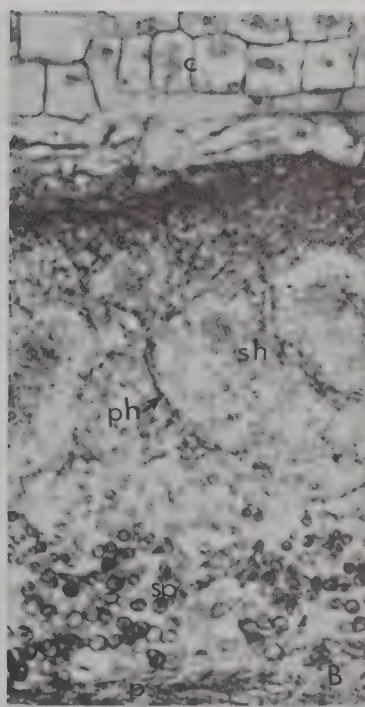
Spores mature first in distal parts of the sorus and close to the peridium. Progressive maturation of spores occurs in the direction of the columella. In older parts of the sorus transformation of the partitioning hyphae to groups of partitioning cells, and great expansion of the original pockets of sporogenous hyphae as spores mature, eliminate the pattern of pockets of young spores invested by partitioning hyphae which is so evident at earlier times.

Sphacelotheca andropogonis

The inflorescence of *Bothriochloa bladhii* has a number of racemes originating close to one another on a short axis. Smutted tillers exhibit a range of symptoms, from replacement of the whole inflorescence by a sorus to development of sori in the lower racemes only, with all or only part of a given raceme being smutted. The sori are long, cylindrical often branched, enclosed by a whitish peridium which eventually ruptures, exposing the spore mass and the columella (Fig. 6; A).

Hyphae in undifferentiated host tissue below the grow-

Figure 6. *Sphacelotheca andropogonis*. (A) sori (x3). (B) parts of longitudinal section of a sorus (x410). c, host cells of the columella; sh, sporogenous hyphae; ph, partitioning hyphae; sp, mature spores; p, peridium. (C) immature spores



ing point of a tiller enter embryonic floral parts soon after initiation of an inflorescence. Delayed entry may result in partial smutting of the inflorescence. Hyphae mass in intercellular positions at the base of each raceme. Just below that pocket of hyphae a host meristem is initiated. The processes of sorus formation and sporogenesis (Fig. 6; B, C) then follow the pattern described for *S. sorghi*.

Sphacelotheca amphilophis

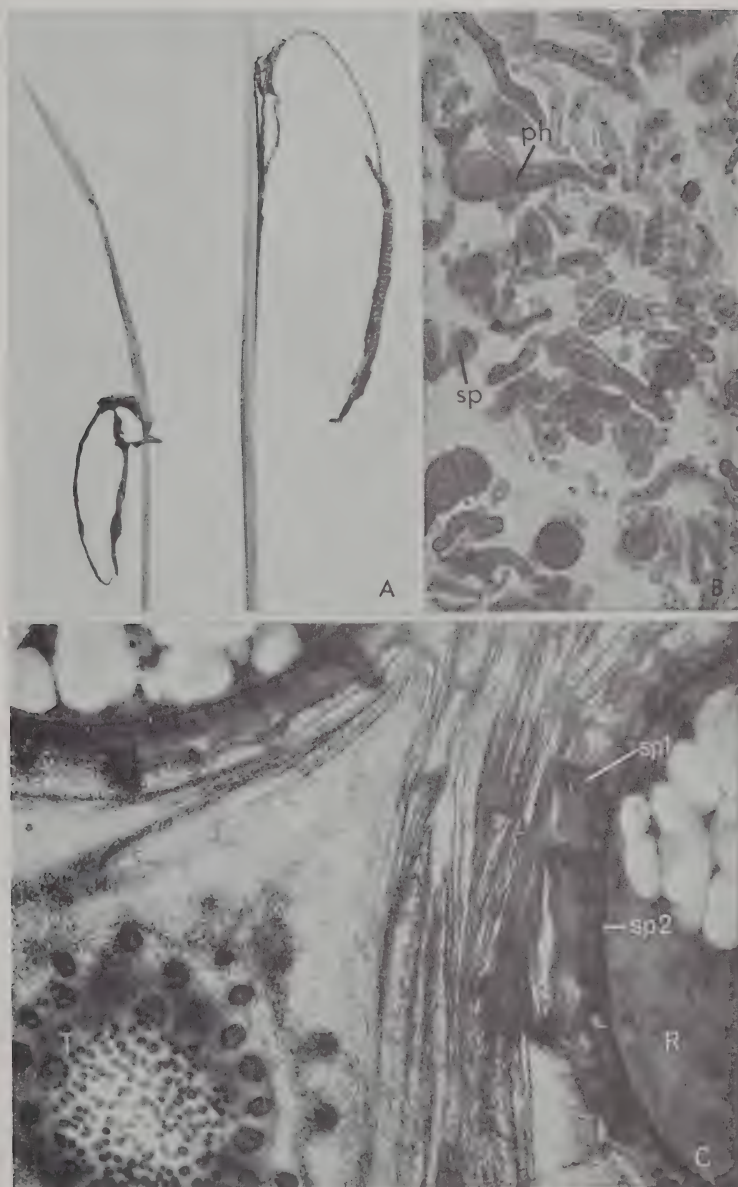
The inflorescence of *Bothriochloa decipiens* consists of several racemes originating close to one another on a short axis. On smutted tillers the inflorescence is replaced by a long cylindrical sorus (Fig. 7; A) at the tip of which are the distorted remnants of the young inflorescence.

Hyphae enter the base of the embryonic inflorescence and proliferate there. Closely adjacent to that pocket of hyphae and just above the topmost node of the tiller a host meristem develops. Sori develop by contemporaneous growth of hyphae and host tissue (Fig. 7; B, C), the processes being the same as those described for *S. sorghi*. The sorus at maturity protrudes beyond the uppermost leaf and extends downwards to the topmost node of the tiller.

Sphacelotheca vanderystii

The inflorescence of *Hyparrhenia filipendula* is a narrow panicle of paired racemes. In smutted plants each raceme is replaced by a sorus up to 1 cm long (Fig. 8; A). Hyphae grow into a young raceme when spikelet primordia are forming. The site of the soral meristem is just above the lowermost spikelet. Sorus development and sporogenesis (Fig. 8; B) follow the pattern described for *S. sorghi*. The distorted remnants of the lowermost spikelet can be

Figure 7. *Sphacelotheca amphilophis*. (A) sori (x1.7). (B) sp, immature spores and ph, partitioning hyphae partly transformed to partitioning cells (x660). (C) section through spores (x12,000). R, radial section, showing spl, primary spines; sp2, secondary spines. T, tangential section.



found on a slight lobe at the base of the sorus. The remnants of floral parts distal to the soral meristem at the time of its formation are carried at the apex of the sorus.

The origin and nature of partitioning cells, termed 'sterile cells' by earlier authors, have not previously been determined. Peck (1882) saw pale, irregular cells mixed with the spores of *Ustilago cylindrica* Peck (*Sphacelotheca andropogonis*, fide Fischer (1953)) but he made no comment on their origin. Clinton (1897) described cells in the sori of *Ustilago sorghi* which he believed had been derived from the peridium and mentioned various characteristics which tally with those of partitioning cells. In another paper Clinton (1902) said that a membrane of sterile cells enveloped the spore mass and that groups of these sterile cells are found within the spore mass. Clinton's observations are probably the origin of an oft repeated statement that sterile cells in the spore mass are derived from the peridium (Zundel, 1953; Fischer, 1953; Fischer & Holton, 1957; Ainsworth, 1965). Fischer & Holton (1957) described the sterile cells as empty, despite Clinton's (1897) observation that they may sometimes have contents. Our work has shown that those cells are nucleate.

Clinton (1897) described the formation of spores of the sorghum smut as being centripetal around a central columella. He mentioned that feature when he (1902) made alterations to the circumscription of *Sphacelotheca*. Fischer & Holton (1957) accepted centripetal spore formation as an important character for *Sphacelotheca*. However, evidence has been adduced earlier in this paper to show that *Sphacelotheca hydropiperis*, the type species, differs markedly from the graminicolous species of *Sphacelotheca* in its sporogenesis. The apparent centripetal formation of spores in *S. sorghi* and some other species of *Sphacelotheca* is a consequence of maturation of pockets of sporogenous hyphae which are being formed progressively around the columella. There is no pre-formed total mass of sporogenous hyphae which are converted to spores in the direction of the columella.

Khanna & Payak (1972), working with mature spores, observed that the spore walls of *Sphacelotheca reiliana* bore spines of two sizes. They deduced that the longer spines were formed by fusion of the distal parts of the shorter spines. We have observed two sizes of spine on the



Figure 8. *Sphacelotheca vanderystii*. (A) sori (x7). (B) Spores at different stages of development (x7000). y1, young spores with primary spines; y2, older spore with primary and secondary spines; e, electron-transparent portion of hyphal septum; d, hyphal cell which has degenerated; g, gelatinized hyphal wall.

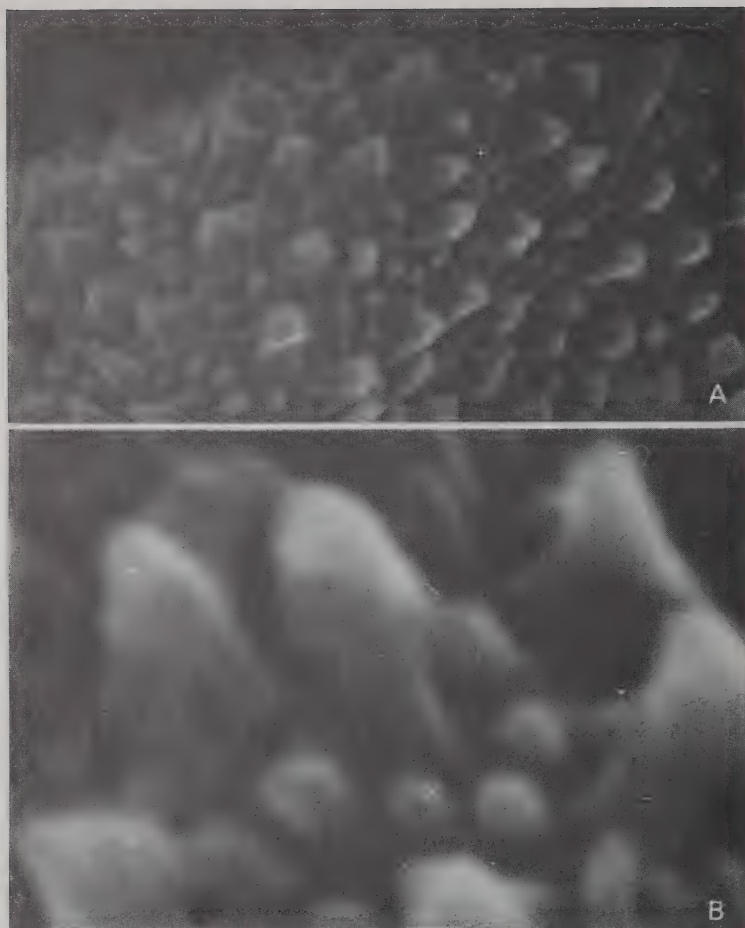


Figure 9. *Sphacelotheca reiliana*. (A) surface view of spore wall, showing primary and secondary spines (x31,200). (B) detail of (A) (x100,000).

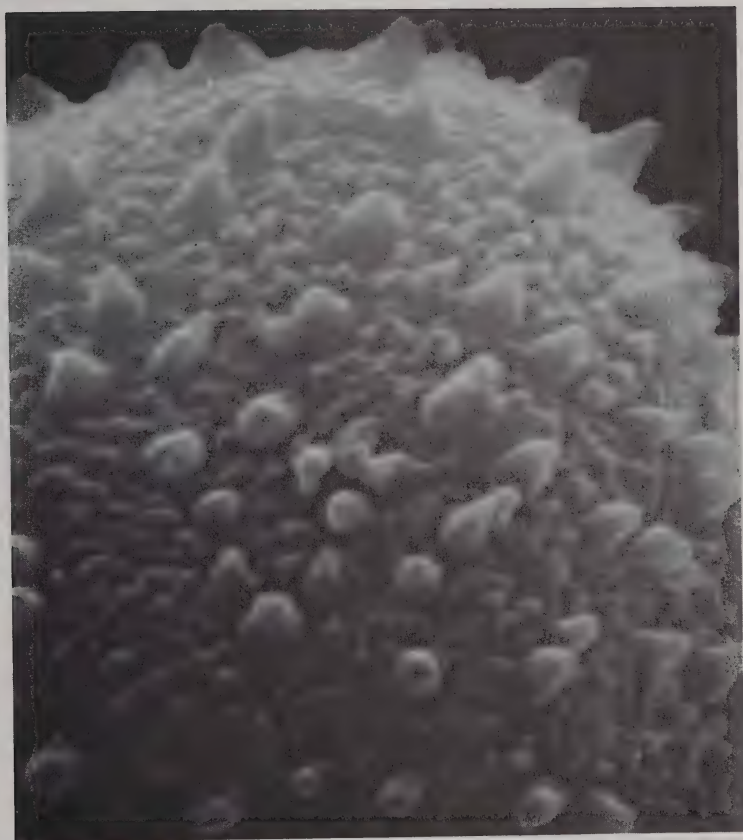


Figure 10. *Ustilago valentula*. Surface view of spore wall, showing two series of spines (x31,200).

walls of mature spores of *S. reiliana* (Fig. 9; A, B) and on both young and mature spores of the several species of *Sphacelotheca* on Poaceae whose sorus ontogeny has been studied. Sections of the spores show that the 'molar-like complexes' described by Khanna & Payak (1972) are the result of several small spines developing at the base of a larger spine formed earlier in the spore's development. Two-seriate spines may not be confined to species of *Sphacelotheca* on Poaceae. Spore walls of *Ustilago valentula* Syd. (Fig. 10) and *U. tricophora* (Link) Kunze (Fig. 11) show two series of spines in surface view at very high magnifications. Whether the structure of the spines of those species is similar to that of certain graminicolous smuts which have been placed in *Sphacelotheca* can be determined only with sections of spores in various stages of development.

The processes of formation of peridium, columella and spore mass are the same in the four smuts from grasses. The site of the soral meristem determines whether florets or all of the inflorescence are replaced by smut sori. The sori of the graminicolous species of *Sphacelotheca* are different in their ontogeny and mature structure from the sori of *Sphacelotheca hydropiperis* on *Polygonum* spp. In Table 1 the characteristics of the smuts of the two groups of hosts are compared. The species from plants of the Poaceae and from *Polygonum* spp. cannot be regarded as congeneric.

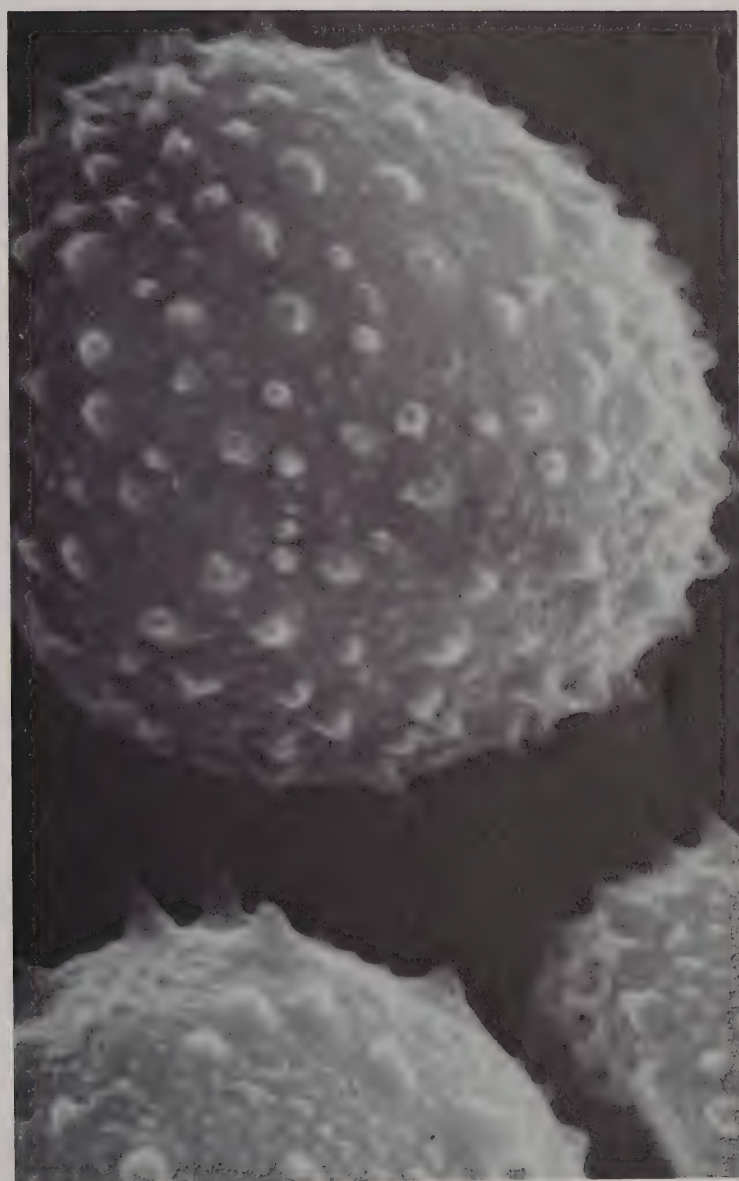
REPUTED SYNONYMS OF *SPHACELOTHECA*

Various authors have placed *Sporisorium* Ehrenb., *Endothlaspis* Sorokine and *Planetella* Savile in synonymy with *Sphacelotheca*.

Sporisorium Ehrenberg apud Link in Linne's Species Plantarum Ed. 4 (Willdenow's), Berlin, 6(2), 86, 1825.

The genus *Sporisorium*, based on *S. sorghi* Ehrenberg apud Link, was validly published. The host was *Sorghum*, collected in Egypt by Ehrenberg. Although extensive enquiries have been made, the type specimen has not been located, and it is concluded that it is no longer extant. The original description of the *Sporisorium sorghi* contains

Figure 11. *Ustilago tricophora*. Surface view of spore wall showing two series of spines (x31,200).



nothing that is inconsistent with Ehrenberg's collection being the same smut as that widely known today as *Sphacelotheca sorghi* (Link) Clint. In that belief we are supported by an opinion from the staff of the Commonwealth Mycological Institute, Britain, that *Sporisorium* was 'clearly based on what we all have been calling *Sphacelotheca sorghi*' (C. Booth, private communication).

The sorghum smut was transferred to *Sphacelotheca* as *S. sorghi* (Link) Clint. by Clinton (1902). He offered no explanation for moving the species from *Sporisorium*. It is noteworthy that the epithet *sorgi* was retained, indicating tacit acceptance that he was dealing with the sorghum smut collected by Ehrenberg. In a later paper Clinton (1904) included *Sporisorium sorghi* among synonyms of *Sphacelotheca sorghi*. That action is probably the reason for Dietel's (1928) listing of *Sporisorium* as a synonym of *Sphacelotheca*. However, *Sporisorium* was erected in 1825 and *Sphacelotheca* in 1884. Fischer (1953) and Zundel (1953) wrote *Sorosporium sorghi* instead of *Sporisorium sorghi* in their lists of synonyms of *Sphacelotheca sorghi*. That has no bearing on the synonymy since it is clearly a spelling mistake. Both authors gave the literature reference for *Sporisorium sorghi*. *Sporisorium* predates *Sorosporium* by four years.

Endothlaspiis Sorokine Revue mycologique 12, 4-5, 1890.

Sorokine (1890) erected the genus *Endothlaspiis* with two species, *E. melicae* Sorokine and *E. sorghi* Sorokine on *Melica ciliata* L. and *Sorghum cernuum* (Ard.) Rorn. respectively. He excluded those smuts from *Ustilago* because there was a hyphal peridium around each spore mass. Sorokine emphasised the absence of a columella in *Endothlaspiis* and thereby distinguished his genus from *Sphacelotheca*. He considered the possibility that the smuts he studied might belong in *Testicularia* or *Doassansia*, rejecting the former because of the absence of hyphae within the spore mass of *Endothlaspiis* and the latter because of its sterile cells around the spore mass were quite unlike those of the species placed in *Endothlaspiis*. Clinton (1904), from a consideration of Sorokine's figures and description, decided that *Endothlaspiis*, with a covering membrane of sterile cells, belonged with *Sphacelotheca*. He listed *Endothlaspiis* as a synonym of *Sphacelotheca* but made no new combinations for the species of *Endothlaspiis*. Ciferri (1928), without seeing Sorokine's specimens and with no reference to Clinton (1904) said that *Endothlaspiis* could not be held distinct.

Table 1

Comparison of soral characteristics of species of *Sphacelotheca* on Polygonaceae and Poaceae

<i>Sphacelotheca</i> spp. on Polygonaceae		<i>Sphacelotheca</i> spp. on Poaceae
Peridium	hyaline, catenulate, subglobose cells	interwoven hyphae
Columella	hyaline, catenulate, subglobose cells; host tissue only at base; not a source of sporogenous or non-sporogenous hyphae.	an integrated structure composed of host tissue and hyphae; sporogenous and non-sporogenous hyphae growing from the hyphal component of the columella
Spore mass	spores developed from hyphae at the base of the sorus; spores at first catenulate with disjunctors, later free from one another; spores not mixed with other structures.	Spores developed from hyphae growing from the columella; sporogenous hyphae at first surrounded by partitioning hyphae, the latter later forming partitioning cells; spores free from one another, with partitioning cells mixed with the spores.

from other genera of the Ustilaginales in the absence of data on spore formation and germination. He assigned Sorokine's species of *Endothlaspiis* to *Sphacelotheca* because the spore mass was enclosed by a fungal peridium, a character which he declared completely defined *Sphacelotheca*. He attached no importance to the columella as a generic character because he believed its presence or absence was dependent on the host organ in which a smut formed its spores. Ciferri made a new combination for the *Melica* smut and a new name for the *Sorghum* smut. In more recent years, various authors have accepted *Endothlaspiis* as a synonym of *Sphacelotheca* (Ainsworth & Sampson, 1950; Fischer, 1953, Fischer & Holton, 1957).

Sorokine's specimens have not been located nor have we found any record of a smut of *Melica* which might possibly be conspecific with *Endothlaspiis melicae*. The only evidence by which the nature of *Endothlaspiis* can be judged is that provided by Sorokine's text and figures. The former is vague, the latter poorly executed. On one matter Sorokine was definite: '.... notre espèce diffère du *Sphacelotheca* en ce qu'elle n'a pas de colonne centrale.' Sorokine's data are difficult to interpret. Certainly they do not justify the description which Zundel (1953) concocted for *Endothlaspiis melicae* or Zundel's acceptance of Ciferri's (1928) opinion that the species should be placed in *Sphacelotheca*. Zundel's account of the nature of the sorus and his description of the spores are speculative and his statement that the sorus has a central columella is directly opposed to Sorokine's observations. The characters of *Endothlaspiis melicae* remain obscure.

The identity of *Endothlaspiis sorghi* is by no means certain. Sorokine, after discussing the smuts of *Sorghum*, insisted that the smut he described was not the same as *Ustilago reiliana*. Fischer (1953), evidently accepting Ciferri's (1928) opinion, listed *Endothlaspiis sorghi* as a synonym of *Sphacelotheca reiliana*. The latter has spores 9-13 μ m diam. in contrast to the former's 7-10 μ m.

Endothlaspiis is poorly defined and its status is obscure. Its characteristics will become known only when the specimens studied by Sorokine (1890) are located and then prove to be adequate to reveal the mode of development and mature structure of the sori. Until more evidence is available there is no justification for regarding *Endothlaspiis* as a synonym of *Sphacelotheca*.

Planetella Savile Can. J. Bot. 29, 326-327, 1951.

Thirumalacher & Whitehead (1975) transferred *Planetella lironis* Savile, the type species of *Planetella*, to *Sphacelotheca*, commenting that its sorus structure was identical with that of *Sphacelotheca*. Savile (1951) described well the sorus structure of *Planetella lironis*. After an examination of the type specimen we agree with Savile that *Planetella* is distinct from other genera. Thirumalacher and Whitehead were in error in placing *Planetella* in synonymy with *Sphacelotheca*.

TAXONOMY OF GRAMINICOLOUS SMUTS ASSIGNED TO *SPHACELOTHECA*

Clinton (1902) confused mycologists' interpretation of *Sphacelotheca* by including in it some smuts of the Poaceae. In the course of time features of those smuts rather than those of the *Polygonum* smut on which de Bary based *Sphacelotheca* have gained acceptance as the criteria for delimiting *Sphacelotheca*. Our detailed study of four smuts of the Poaceae shows that those smuts have characteristics very different from those by which de Bary (1884) defined *Sphacelotheca*. *Sporisorium sorghi* is the nomenclatural type of the smut currently known as *Sphacelotheca sorghi*. No reasons have ever been published for abandoning *Sporisorium* as a genus for the sorghum smut although the epithet *sorghi* has been retained to this day. *Sporisorium* was validly published and undoubtedly referred to the same sorghum smut as the one studied in detail in this paper. Our fruitless enquiries have led us to the conclusion that the type specimen of *Sporisorium sorghi* is no longer extant. Therefore, a neotype for that species is nominated below. The sorghum smut and other fungi with similar characteristics must be placed in *Sporisorium*. In the Ustilaginales, only *Ustilago* predates *Sporisorium*. The criteria for *Ustilago* were defined by Langdon & Fullerton (1975), and that genus is not acceptable as a repository for the grass smuts we have considered in this paper.

The characters by which mature specimens of species of *Sporisorium* can be recognised are the hyphal peridium, columella composed of host tissues and hyphae, and spores intermixed with partitioning cells. The latter can be seen readily if sorus contents are mounted in lactophenol containing acid fuchsin.

SPORISORIUM Ehrenberg in Link in Linné's Species Plantarum Ed. 4 (Willdenow's), Berlin, 6, (2), 86, 1825.

Sori replacing inflorescences or florets. Peridium of interwoven hyphae overlain by several layers of host tissue. Columella composed of host tissues permeated by inter- and intra-cellular hyphae. Hyphae growing from the columella of young sori differentiating as pockets of sporogenous hyphae enclosed by non-sporogenous partitioning hyphae, the precursors of partitioning cells. Spores at first somewhat agglutinated, later pulverulent, dark, single, globose to subglobose. Partitioning cells hyaline, subglobose, in groups or chains, intermixed with the spores.

Type species: *Sporisorium sorghi* Ehrenberg in Link in Linné's Species Plantarum, Ed. 4 (Willdenow's), Berlin, 6, (2) 86, 1825.

Sporisorium sorghi Ehrenberg in Link in Linné's Species Plantarum, Ed. 4 (Willdenow's), Berlin, 6, (2), 86, 1825.

Synonyms: *Ustilago sorghi* Pass. in Thümen, Hedwigia, 12, 114, 1873; *Sphacelotheca sorghi* (Ehrenb.) Clint., J. Mycol. 8, 140, 1902.

Sori in florets, covered by a hyphal peridium overlain by host tissue. Columella central, composed of host tissues permeated by hyphae. Spores globose to subglobose, single, dark, minutely echinulate, up to 10 μ m for longest dimension. Partitioning cells in groups or chains, hyaline. Specimens examined: On *Sorghum bicolor* (L.) Moench. (= *S. vulgare* Pers.). Italy, 1872, G. Passerini (Thümen, Herb. mycol. oeconomicum, no 63.) (B); Gatton, Queensland, 6 Apr. 1939, P.J. Skerman (BRIU 127); Urbana, Ill., U.S.A., 1895, G.P. Clinton (VPRI); Virginia, U.S.A., 15 Apr. 1902, C.R. Bail (ADW); Roseworthy, Sth. Australia, 29 Mar. 1915, C.F. Stephens (ADW). On *S. leiocladum* (Hack.) Hubb. Hirstglen, Queensland, 7 Mar. 1941, R.F.N. Langdon & D.A. Herbert (BRIU 341); Killarney, Queensland, 6 Jan. 1966, R.A. Fullerton (NEOTYPE, BRIU 2426). On *S. plumosum* (R. Br.) Beauv. Chillagoe, Queensland, 4 Apr. 1938, S.T. Blake (BRIU 1942).

Some changes in the synonymy given by Fischer (1953) are necessary. The epithet *sorghi* of 1825 is now to be attributed to Ehrenberg. Passerini (1873) used the epithet *sorghi* for a sorghum smut he described as a 'spec. nov.'

from his own collections in Italy. He made no reference to Ehrenberg's *Sporisorium sorghi* and evidently believed that the sorghum smut was previously unknown. Lindeberg (1959) noted that Passerini had used the epithet *sorghi* for what he regarded as a new species, but other authors have written their lists of synonyms to indicate that Passerini had transferred the species from *Sporisorium* to *Ustilago*.

It is unfortunate that the generic name of this smut, a cosmopolitan parasite of *Sorghum* spp., resembles another generic name in the same group of fungi. However, this situation is not unique in relation to plant names. Link (1825) cited the genus as *Sporisorium* Ehrenberg in litteris and evidently wished to attribute the specific epithet to Ehrenberg also. The epithet *sorghi* has been ascribed to Link in most instances where the species has been cited formally, but article 46, Rec. 46D of the International Code of Botanical Nomenclature gives support to the view that the genus and species should be attributed to Ehrenberg.

Sporisorium amphiphis (Syd.) Langdon & Fullerton comb. nov.

Basionym: *Sphacelotheca amphiphis* Syd. Annal. Mycol. 33, 232, 1935.

Specimens examined: On *Bothriochloa insculpta* A. Camus, Transvaal, South Africa, June 1931, L.C.C. Liebenberg (TYPE, PRE); on *B. decipiens* (Hack.) Hubbard, Esk, Queensland, Mar. 1967, R.A. Fullerton (DAR 25286).

Sporisorium vanderystii (P. Henn.) Langdon & Fullerton comb. nov.

Basionym: *Ustilago vanderystii* P. Henn. Ann. Mus. Congo Bot. V. 2, 86, 1907.

Synonym: *Sphacelotheca vanderystii* (P. Henn.) Ling Lloydia, 14, 104, 1951.

Specimens examined: On *Hyparrhenia rufa* (Nees) Stapf. Dembo, Belgian Congo, June 1906, H. Vanderyst B31 (LECTO-TYPE, BR). On *Hyparrhenia filipendula* (Hochst.) Stapf. Buaraba, Queensland, Feb. 1966, R.A. Fullerton (DAR 25284); Brisbane Queensland, 22 Mar. 1943, M.S. Clemens (BRIU 51) (part of specimen at BPI, det. Ling)

A full synonymy for this smut was given by Ling (1951) when making the combination *Sphacelotheca vanderystii* (P. Henn.) Ling.

Sporisorium reilianum (Kühn) Langdon & Fullerton comb. nov.
 Basionym: *Ustilago reiliana* Kühn In Rabenhorst, Fungi
 Europ. No. 1998, 1875.

Synonym: *Sphacelotheca reiliana* (Kühn) Clint. J. Mycol. 8.
 141.1902

Specimens examined: On *Sorghum bicolor* (L.) Moech. Rabenhorst, Fungi europaei, No. 1998 (TYPE, BPI); Sydow, Ustilagineen, no. 116, Germany, Sept. 1894 (BPI); Illinois, U.S.A., Sept. 1897, G.P. Clinton (BPI); Brookstead, Queensland, 13 Mar. 1951, R. Morwood (BRIU 743). On *Zea mays* L. Lawes, Queensland, Apr. 1960, N. Fox (BRIU 747). On *Hackelochloa granularis* (L.) Kunze. Townsville, Queensland, 20 Mar. 1938, S.T. Blake (BRIU 63); Sydow, Ustilagineen, no. 451, Pusa, India, 28 Sept. 1907, E.J. Butler (VPRI).

Fischer & Shaw (1953) have listed synonyms of *Ustilago reiliana*. This cosmopolitan smut of maize and sorghum was transferred to *Sorosporium* by McAlpine (1910) who was misled by the aggregations of spores in very young parts of the sorus. McAlpine recorded that 'sterile cells' were mixed with the spores. Our studies of the sorus have shown that the smut belongs in *Sporisorium*.

Sporisorium doidgeae (Zundel) Langdon & Fullerton comb. nov.
 Basionym: *Sphacelotheca doidgeae* Zundel Mycologia 22,
 131, 1930.

Specimen examined: On *Bothriochloa glabra* A. Camus. Natal, Africa, 26 Dec. 1911, E.M. Doidge (TYPE, PRE).

The smut of *Bothriochloa bladhii*, *Sphacelotheca andropogonis*, which was examined in detail has not been transferred to *Sporisorium* here. The type specimen has not become available to us and in the absence of the nomenclatural type we have refrained from making the transfer. We have seen the type specimen of *Ustilago ischaemi* Fckl. and our specimen of the *Bothriochloa* smut is conspecific with it. Fischer & Shaw (1953) have shown that *U. ischaemi* is a synonym of *Sphacelotheca andropogonis*. That smut is but one of scores of species which, judging by their descriptions, will probably be referable to *Sporisorium* when the type specimens are examined.

DISCUSSION

The status of the genus *Sphacelotheca* has now been resolved. Its validity is beyond doubt. Whether species of,

Sphacelotheca are confined to the Polygonaceae has yet to be determined. There are many smuts of Poaceae and some of Cyperaceae which have been included in *Sphacelotheca*. Perusal of their descriptions suggests that many of them will prove to be species of *Sporisorium*.

It is unfortunate that de Bary's (1884) short account of the sorus ontogeny and mature structure of *S. hydropiperis* has been ignored. The extension of the circumscription of *Sphacelotheca* by Clinton (1902) which allowed gram-inicolous smuts with sporogenous hyphae growing from a central columella to be included has led many later mycologists into error. Savile (1953), when discussing some smuts of *Polygonum* species, remarked that an ontogenetic study of the sori might resolve the problem of intergradation between *Ustilago* and *Sphacelotheca*. Probably no such intergradation exists. *Sphacelotheca* differs markedly in its soral ontogeny from *Ustilago* which, as Langdon & Fullerton (1975) have shown, has no fungal structures associated with its spore mass. Some smuts of the Polygonaceae are undoubtedly referable to *Ustilago*. The species *hydropiperis*, and probably some others, belong in *Sphacelotheca*. The way is now clear for a taxonomic revision of the smuts of the Polygonaceae.

We have studied *Sporisorium* spp. which, in the common parlance of mycologists, have sori either in inflorescences or in ovaries. The ontogeny of the sori is the same in each case. In soral meristems the host tissues associated with the fungal portions of the sorus are formed concurrently with the latter, and would not form in non-infected plants. Inflorescences are not destroyed except in the sense that their development is stopped when they are still very small. The sori of *S. sorghi* do not originate in ovaries but in rachillae of the florets. A similar origin has been reported for sori of *Sorosporium cryptum* McAlp. and *S. polycarpum* Syd. but the sori of *S. consanguineum* Ell. & Ev. are formed in ovaries (Langdon & Fullerton, 1975). For many smuts it may not be possible to determine the exact site of sorus initiation by an examination of mature specimens. In the absence of precise information it would be preferable to use the term floret smut rather than ovary smut. In the several species of *Sporisorium* the marshalling of host cells and fungal hyphae proceeds in the same manner irrespective of the site of the soral meristem. The particular host organ involved does not determine the nature of the sorus formed. In view of this, it is doubtful

whether smuts with the same characters but differing in the location of the sorus, for example in inflorescences or in florets, should be considered as separate species.

The sporogenous hyphae of *Sporisorium* spp. are converted to spores by processes similar to those involved in sporulation in species of *Ustilago* (Langdon & Fullerton, 1975). Clinton (1897), examining *U. sorghi* (*Sporisorium sorghi*), concluded that spore formation was different in that species from what was then known for species of *Ustilago*. He was considering the matter in the context of the order of events in the whole spore mass rather than in reference to the changes in sporogenous hyphae themselves. The latter he acknowledged to be similar to what he saw in *Ustilago zeae* (*Ustilago maydis*).

In the youngest parts of sori of *Sporisorium* spp. clumps of agglutinated spores may be found. Being subglobose these spore aggregations may be mistaken for true spore balls and the smut then placed in *Sorosporium*. McAlpine (1910) transferred a smut of maize to *Sorosporium* as *S. reilianum* after finding globose to irregular spore aggregations in very young sori. He also recorded "sterile cells" mixed with the spores. Since the sori of some graminicolous species of *Sorosporium* have fungal peridia and columellae his mistake is understandable. His erroneous conclusion concerning the generic position of the maize smut, now known to belong in *Sporisorium*, emphasises the need to combine data obtained from both developing and mature sori before a decision on the generic position of a smut is reached.

Acknowledgements

Our work has been facilitated by grants from the University of Queensland Research Fund and the award of a Commonwealth Post-graduate Scholarship to the junior author. We are grateful for the help given by the herbarium curators who have lent specimens to us and in some cases engaged in fruitless searches. In particular we are indebted to Dr. Henning Knudsen, University of Copenhagen, for the information and photographs of *Sphacelotheca hydropiperis* which he sent to us. We thank several of our colleagues, and especially Mr. John Walker of the Biological and Chemical Research Institute, Rydalmere, N.S.W., for the very useful discussions we have had with them.

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Vol. VI, No. 3, pp. 457-463

January-March 1978

SOME SPECIES OF TILLETIA FROM AUSTRALIA

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SUMMARY

The generic position of a smut sporing on leaf surfaces of *Phragmites australis* is discussed. This smut's characteristics have been compared with those of foliicolous species of *Orphanomyces* and *Clintamra*. The smut of *Phragmites* has been described as a new species of *Tilletia*. Two other species of *Tilletia* from Australia are discussed.

Tilletia nigrifaciens Langdon & Boughton sp. nov.

Sori nudi, in paginae foliorum. Sporae globosae, subinde subglobosae, fuscae, 18-24 μ m diam.; exosporium reticulatum; vagina gelatinosa tenuis. Cellulae steriles globosae vel subglobosae, hyalinae, 16-32 μ m diam., paries crassitie 1-4 μ m.

Specimens examined: On *Phragmites australis* (Cav.) Trin. ex Stendel: Logan River, Queensland, Australia, 18 May 1974, R.F.N. Langdon, BRIU 2533 (TYPE); Broadbeach, Queensland, 26 Aug. 1964, D.J. O'Dowd, BRIU 2534; Broadbeach, Queensland, 26 May 1965, R.A. Fullerton, BRIU 2251.

Although *Phragmites australis* is widespread on stream banks and in marshes in south-eastern Queensland, its smut has been found at only two sites. The mycelium is perennial in the rhizomes of the host. Smutted plants which were moved from a riverine site to garden conditions in 1974 have produced smutted culms each year since.



Figure 1. Smutted culms of *Phragmites australis*. A. Non-flowering culms. B. Culms with inflorescences. (Scales in millimetres).

Infected plants are conspicuous. Dark masses of spores cover much of the adaxial surfaces of leaves on distal parts of culms when *Phragmites australis* is entering its flowering phase at the end of summer. Some smutted culms do not develop inflorescences (Fig. 1; A). Others do (Fig. 1; B), and the inflorescences range from normal to greatly reduced and distorted. Smutted leaves on the distal parts of non-flowering culms are crowded, small and distorted. In culms with inflorescences the internodes in distal parts are longer than those of non-flowering culms, and the leaves on which spores form are small and distorted.

Sori cover extensive areas of the adaxial surfaces of leaf blades. Rarely, sori of limited extent occur on adaxial surfaces of leaf sheaths, close to the ligule, and on the abaxial surfaces of leaf blades. Leaf tissue beyond the margins of sori remains green, and beneath the spore masses it is at first chlorotic and eventually necrotic. Streaks of dark, necrotic tissue extend beyond the soral areas in both directions, some reaching into the leaf sheaths.

A comparison of transverse sections of healthy and infected leaves (Fig. 2; F, G) shows that in the presence of the pathogen, the leaf is thicker. Most cells of the infected leaf increase in size, but the major effect is brought about by hypertrophy of the intercostal mesophyll cells and an interpolation of parenchyma cells between the veins and the adaxial sclerenchymatous girders. The veins, which in a healthy leaf are equidistant between the two epidermises, are near to the lower epidermis of the diseased leaf. Two major changes are apparent in the mesophyll which in the normal leaf consists of arm cells (Metcalf, 1960) richly provided with chloroplasts. In those parts of the leaf which underlie sori, the walls of the mesophyll cells are not invaginated. In these mesophyll cells, chloroplasts are initially infrequent and finally absent.

A noticeable feature of the adaxial epidermis of normal leaves is the regularly disposed groups of bulliform cells; these are absent from the diseased leaf. Guard cells occur in the appropriate places in the adaxial epidermis but they are not as big as those of the healthy leaf. In the abaxial epidermis they enlarge to match the other lower epidermal cells. The epidermal

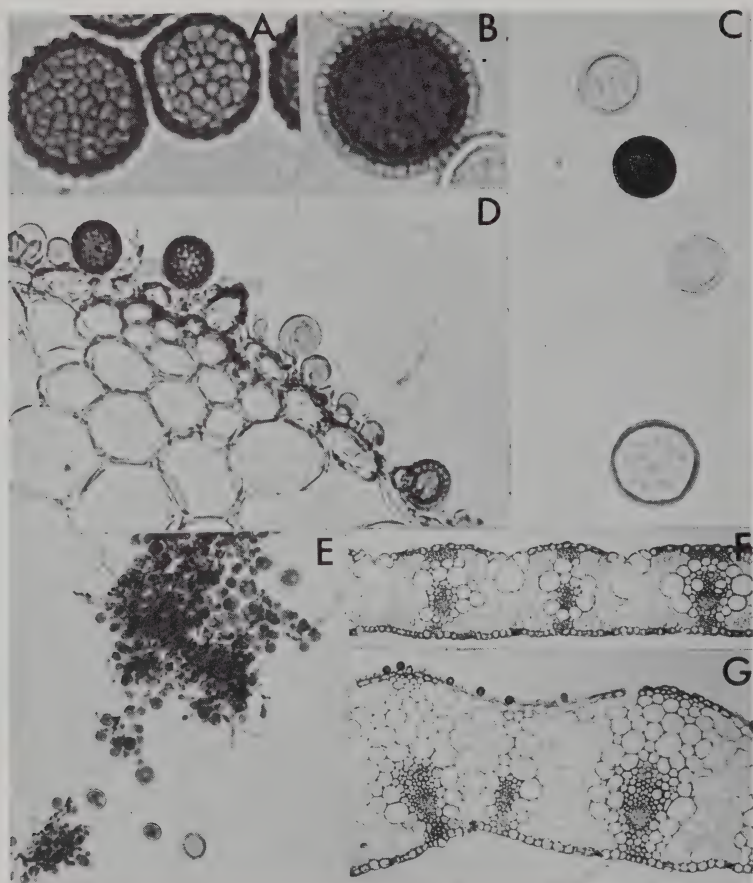


Figure 2. *Tilletia nigrifaciens*. A. Spores, surface view, (x1000). B. Spores, median optical section, (x1000). C. Spores and sterile cells, (x400). D. Sporulation on leaf surface, (x400). E. Mycelium from leaf surface showing mode of sporulation, (x400). F. Section of normal leaf of the host (*Phragmites australis*), (x63). G. Section of smutted leaf of host, (x63).

cells under a developing sorus appear intact (cf. *Clintonmra nolinae*, (Cordas & Durán, 1976)) but those underlying a mature sorus are shrivelled and may eventually erode away. There is phloem degeneration in those parts of leaves on which sporulation occurs.

Sporulation begins when the leaves are very young and still rolled around one another. At this stage the leaf blades are still concealed by the sheaths of older leaves. Hyphae growing from the internal tissues of the leaf form a dense mat on the adaxial surface. Rarely there is limited emergence of hyphae onto an abaxial surface. The hyphae are freely branched. Apical portions of hyphal branches swell and are rapidly transformed to spores or sterile cells (Fig. 2; D). The latter are few relative to the number of spores formed.

Spores taken from living plants as well as spores kept on air-dried leaves in the laboratory for up to 1y have been incubated at various temperatures and in the presence of extracts of host tissues and of soil. No spores germinated. The same result was obtained with spores which had developed in the autumn (May, in Queensland) and had remained on the plants in the countryside until after the winter (September).

Quite recently the genera *Orphanomyces* Savile and *Clintonmra* Cordas & Durán have been erected for certain smuts with sori associated with leaves. The species of *Orphanomyces* (Ustilaginaceae) bear spores in a crust outside the intact epidermis of leaves of systematically infected plants (Savile, 1974). A similar condition has been described for the type species of *Clintonmra* (Tilletiaceae) (Cordas & Durán, 1976). Cordas & Durán supported the opinion offered by Savile that the external position of the sorus was grounds for excluding Clinton's (1904) species *nolinae* from *Melanotaenium* de Bary and for erecting a new genus for it. In the context of discussion about the species placed in *Orphanomyces* and *Clintonmra* respectively there are quite reasonable grounds for the erection of those genera. Such actions do not necessarily constitute grounds whereby other smuts with external sori should be excluded from long existing genera. Cordas & Durán (1976) have accepted the principle of evolutionary parallels for sorus location. Although sori may occupy similar locations on the hosts, there are matters such as sporogenesis and the structures present in mature sori

which must be given due weight when a decision on the generic position of a smut is being made.

The smut of *Phragmites australis* has sorus location similar to that of species of *Orphanomyces* and *Clintamra*. Knowledge of the mode of germination of its spores is lacking and therefore it would not be possible to determine to which genus, *Orphanomyces* or *Clintamra*, the smut should be referred if the decision were to be based only on location of the sorus. There are some features of the smut of *Phragmites* which provide strong evidence that it should be placed as a species of *Tilletia*. These are as follows:- (i) the processes of sporulation (Fig. 2; E) conform to those described by Fischer von Waldheim (1872) and Fischer & Holton (1957) for *Tilletia*, (ii) sterile cells are associated with the spores in the sorus (Fig. 2; C), (iii) the spores are relatively large and have a gelatinous sheath (Fig. 2; A, B).

Savile (1974) did not describe how spores formed in *Orphanomyces arcticus* (Rostr.) Savile. Sporulation in *Clintamra nolinae* (Clint.) Cordas & Durán is different from that observed in the smut of *Phragmites*. Attempts to germinate the latter's spores are still being made. If germination were shown to be of the *Tilletia* type the case for including the smut of *Phragmites* in *Tilletia* would be strengthened. If perchance the germination were of the *Ustilago* type a reassessment of the smut's generic position would be necessary.

Tilletia eragrostidis Clint. & Ricker. J. Mycol. 11, 111, 1905.

Specimen examined: On *Eragrostis japonica* (Thur1.) Trin.: Clarke River, Queensland, 8 July 1954, S.T. Blake, BRIU 1485.

Dr. R. Durán of Washington State University, U.S.A., has compared our specimen of this smut with the type specimen and confirmed its identity. *Tilletia eragrostidis* has been reported previously only from U.S.A. The smut possibly has a wider circum-Pacific distribution than that now established. The sori, developed in ovaries, are less than 1mm long. Only a small number of florets in a panicle are smutted. The smut could be overlooked during field collecting. The specimen from Queensland was found by the late Dr. S.T. Blake on a herbarium specimen of the host during his taxonomic studies of Poaceae.

Tilletia texana Long. In Clinton, J. Mycol. 8, 149, 1902.

Specimen examined: On *Stipa setacea* R.Br. Ooline, Queensland 31 Mar. 1936, S.T. Blake, BRIU 40 (IMI 42693).

Herbert & Langdon (1941) recorded this smut as *Tilletia hypsophila* Speg. (= *T. hyalospora* Mass.). Durán & Fischer (1961) have commented on the extension of the host range and the geographic distribution of *T. texana* resulting from their determination of the identity of the specimen from Queensland.

Acknowledgement

Our work has been facilitated by grants from the University of Queensland Research Fund.

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MYCOTAXON

Vol. VI, No. 3, pp. 464-476

January-March 1978

INDEX OF TAXA IN THE GENUS PSILOCYBE

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SUMMARY

A list of 390 specific, varietal, and form epithets previously described or considered in the genus Psilocybe is given. We tentatively exclude 210 taxa, since they belong to different genera in the modern concept, are synonyms, doubtful species, or nomina nuda.

Fourteen new combinations, based on type studies, are made from Psilocybe into Agrocybe (2), Melanotus (1), Naeematoloma (3), and Psathyrella (8). Hallucinogenic species (73) are marked with an asterisk.

The abbreviated bibliographic reference codes used in the present paper are based in part on the system used by Donk in his book CHECK LIST OF EUROPEAN POLYPORES (1974).

ACKNOWLEDGMENTS

The senior author wishes to thank the Guggenheim Memorial Foundation, N.Y., and COFAA of the Instituto Politécnico Nacional, Mexico City, for support of his Psilocybe research in preparation of a monograph on the genus. He also expresses his thanks to curators and directors of the following herbaria for loan of types and other collections: AD, BAFC, C, CUP, E, F, FH, FLAS, GB, H, IB, K, L, LD, LFG, LG, LPS, MICH, NY, NYS, O, ORE, PACA, PC, PRM, QUE, SFSU, SGO, TENN, TNS, UPS, WTU, ZT, and the Hongo herbarium at Shiga University, Otsu, Japan. We further thank Drs. E. Horak and R. E. Machol for their help in furnishing us with certain reference data, and Dr. A.H. Smith for critical suggestions during the preparation of the manuscript.

BIBLIOGRAPHIC REFERENCE CODES

- (AB) Ann. Bot.
- (ABA) Ann. Mus. nac. Buenos Aires
- (AEC) An. Esc. nac. Ci. Biol., México
- (AgM) Agaricaceae of Michigan (Kauffman)
- (Am) Annls. mycol.
- (ANS) Ann. Rep. N.Y. State Museum
- (BB) Br. Basid. (Rea)
- (BBr) Bull. Jard. bot. Brx.
- (BCo) Bol. Acad. nac. Ci. Córdoba
- (BF) Brit. Fung.-Fl. (Masse)
- (BFi) Bidr. Finl. Nat. Folk (Karsten)
- (Bl) Blätterpilze (Ricken)
- (BMH) Bull. N.Y. Mus. nat. Hist.
- (BmI) Bull. misc. Inf., Kew
- (BNb) Bull. N.Y. bot. Gard.
- (BnH) Beiheft nov. Hedwigia
- (BNS) Bull. N.Y. State Museum
- (Bro) Brotéria
- (BS) Beiheft Sydowia
- (BSb) Bolm. Soc. broteriana
- (BSF) Bull. Soc. mycol. Fr.
- (BSM) Bol. Soc. Mex. Mic.
- (BTC) Bull. Torrey bot. Club
- (Ch) České houby (Velenovský)
- (ChE) Les Champ. d'Europe (Heim)
- (ChM) Les Champ. halluc. du Mexique (Heim & Wasson)
- (CiM) Ciencia, México
- (CJV) Champ. du Jura et Vosges (Quélet)
- (CM) Česká Mykol.
- (CrA) Compt. r. Acad. Sc., Paris
- (Cza) Champ. sup. zone alpine, Parc Nat. Suisse
- (D) Darwiniana
- (DAB) U.S. Dept. Agric. tech. Bull.
- (Bba) Denkschrift bayer. bot. Ges.
- (DCs) Dict. iconogr. Champ. sup. (Laplanche)
- (DM) Derm. et Mel.
- (EBJ) Bot. Jahn. (Engler)
- (FAC) Fl. Anal. Champ. sup. (Kühner & Romagnesi)
- (FaD) Fl. agar. Dan. (Lange)
- (Fic) Fl. ital. crypt. (Fungi)
- (Fl) Flora
- (FP) Führer Pilzkunde (Kummer)
- Fries 1821-1823 Syst. Myc.
- (FuF) Fungi of the Faeröes (Möller)
- (G) Grevillea
- (H) Hedwigia
- (Ho) Hoppea
- (IBF) Illustr. Brit. Fungi (Cooke)
- (IcM) Iconographia Mycol. (Bres.)
- (Ih) Iheringia (Bot.)
- (Im) Icones mycologicae (Boudier)
- (JaR) J. agr. Research
- (JFA) J. Fla. Acad. Sc.
- (JJB) J. Jap. Bot.
- (JLS) J. Linn. Soc. (Bot.)
- (JMS) J. Elisha Mitch. Sc. Soc.

- (JMy) J. Mycology
 (KB) Kew Bull.
 (KK) Kleine Kryptogamenflora II, b/2, 1967
 (L) Lilloa
 (LH) Les Champ. qui croissent en France (Gillet)
 (Ll) Lloydia
 (M) Mycologia
 (MG) Medd. Grønland
 (Myc) Mycotaxon
 (Myp) Mycopath. Mycol. appl.
 (NAP) N. American species of Pholiota (Smith & Hesler)
 (NBF) Not. Br. Fungi (Massee)
 (Nca) Naturaliste canad.
 (NEd) Not. Roy. bot. Gard., Edinb.
 (NH) Nova Hedwigia
 (NIC) Nouv. Invest. Champ. halluc. du Mexique (Heim)
 (NPF) Nat. Pfl. Fam. (Engler & Prantl)
 (NT) Nat. Tijdschrift
 (Pe) Persoonia
 (PFl) Proc. Fla. Acad. Sc.
 (PMi) Pap. Mich. Acad. Sc.
 (RM) Revue Mycol. (Paris)
 (SAW) Sitzungsber. K. Akad. Wiss., Wien
 (SF) Syll. Fung. (Saccardo)
 (Sy) Sydowia
 (SyF) Symb. Fenn. (Karsten)
 (TBS) Trans. Br. mycol. Soc.
 (TmJ) Trans. mycol. Soc. Jap.
 (TPR) Trans. Proc. Roy. Soc. So. Austr.
 (TSN) Trans. Sapp. nat. hist. Soc.
 (VZB) Verh. K. K. Zool. Bot. Ges., Wien
 (ZP) Zeitschrift für Pilzk.
 (ZPk) Zeitschrift für Pflanzenkr.

CHECK-LIST OF TAXA IN THE GENUS PSILOCYBE (Fr.) Kumm.
 = DECONICA W.G. Smith ex Karst.

- acadiensis A.H. Smith 1946 (JMS 62): 192
acutipilea (Deconica) Speg. 1889 (BCo 11): 381 = Psilocybe
acutipilea (Speg.) Guzmán *?
acutissima Heim 1959 (RM 24): 106
acutiuscula (Deconica) Sing., in LE herb. = Kuehneromyces
vernalis (Peck) Sing. & Smith 1946 (M 38): 518
acutopapillata, P. yungensis var., Sing. & Smith 1958
 (M 50): 295; nom. nud.
aerugineomaculans (Höhnelt) Sing. & Smith 1958 (M 50): 273 =
Psilocybe subaeruginascens Höhnelt
aggericola Sing. & Smith 1958 (M 50): 142 *
aggregata Clel. & Cheel 1918 (TPR 42): 134; doubtful sp.
agnata (Britz.) Sacc. 1887 (SF 5): 1047; doubtful sp.
agraria (Fr.) Karst. 1879 (Bfi 32): 505; doubtful sp.
agrariella Atk. 1909 (Am 7): 374 = Psathyrella
agrariella (Atk.) A.H. Smith
alachuana Murr. 1942 (Ll 5): 155 = Simocybe alachuana
 (Murr.) Sing.

- albida, P. caerulescens var., Heim 1967 (NIC): 170 =
P. caerulescens Murr. var. caerulescens
albobrunnea Beeli 1938 (BBr 15): 42 = Psathyrella
candolliana (Fr.) Maire
albobrunnea Lutz 1907 (BSF 54): 191; doubtful sp.
albofimbriata (Naucoria) Rick 1930 (Bro 24): 110 =
Psilocybe sp.
alboquadrata (Berk.) Sacc. 1887 (SF 5): 1043; doubtful sp.
aleuriata Heim & Remy 1926 (BSF 41): 459; doubtful sp.
alnetorum Sing. 1952 (L 25): 332
ammophila (Dur. & Lév.) Gill. 1878 (LH): 587 = Psathyrella
ammophila (Dur. & Lév.) Orton
andina Guzmán 1977 (Myc) in press
anellariiformis (Murr.) Sing. 1973 (BS 7): 82
angulata (Batsch ex Pers.) Sing. 1961 (Pe 2): 7
angulata-olivacea, P. mexicana f., Heim & Cailleux 1967
(NIC): 140 = P. mexicana Heim f. mexicana
angustispora A.H. Smith 1946 (JMS 62): 193
antillarum (Fr.) Sacc. 1887 (SF 5): 1052 = Panaeolus
antillarum (Fr.) Dennis
apelliculosa Orton 1969 (NED 29): 118
appendiculata Rick 1920 (Bro 18): 62
araucana Sing. 1969 (BnH 29): 239 *
arenulina (Peck) Sacc. 1887 (SF 5): 1057 = Psathyrella
arenulina (Peck) A.H. Smith
areolata (Klotz.) Sacc. 1887 (SF 5): 1047 = Psathyrella
velutina (Pers. ex Fr.) Sing.
argentina (Speg.) Sing. 1969 (BnH 29): 241
argentipes Yokoyama 1976 (TmJ 17): 349 *
arrosus, Ag. (Psilocybe) Schulz. 1876 (VZB): 418; doubtful
sp.
asperospora Clel. 1934 (TPR 58): 212 = Panaeolus
foeniseii (Pers. ex Fr.) Kühn. ?
atomatoides Thom & Lathrop 1925 (JaR 30): 625; doubtful sp.
atomatoides (Peck) Sacc. 1887 (SF 5): 1048 = Psathyrella
atomatoides (Peck) A.H. Smith
atrobrunnea (Lasch) Gill. 1878 (LH): 586
atorrufa (Schaeff. ex Fr.) Quél. 1872 (CJV): 117 =
Psilocybe montana (Pers. ex Fr.) Kumm.
australiana Guzmán & Watling 1977 (NED) in press *
australis (Deconica) Horak 1967 (D 14): 363 = Psilocybe sp.
aztecorum Heim 1957 (RM 22): 78 *
baeocystis Sing. & Smith 1958 (M 50): 141 *
bifrons (Berk.) P. Henn. 1900 (NPF 1 (1**)): 235 =
Psathyrella bifrons (Berk.) A.H. Smith
bipellis (Quél.) Pereira-Coutinho 1931 (BSb 7): 340 =
Psathyrella bipellis (Quél.) A.H. Smith
blattariopsis (Speg.) Sing. 1950 (L 23): 214 *?
bolivarii Guzmán 1968 (CiM 26): 25 *
bonetii Guzmán 1968 (AEC 17): 9 *
borealis Guzmán 1977 (BSM 11) in press
brasilensis Guzmán 1977 (Myc) in press *
brevipes, P. atrorufa f., Kill. 1936 (DbA 20): 78
brevispora, P. mexicana var., Heim 1956 (CrA 242): 1393 =
Psilocybe muliercula Sing. & Smith

- brunneocystidiata Guzmán & Horak 1978 (Sy 30) in press *
bryophila (Deconica) Peck 1893 (ANS 46): 106 =
Psilocybe montana (Pers. ex Fr.) Kumm.
bulbosa (Peck) A.H. Smith 1948 (M 40): 694
bulbosulus, Ag. (Psilocybe) Schulz. 1876 (VZB): 417; doubtful
 sp.
bullacea (Bull. ex Fr.) Kumm. 1871 (FP): 71
caeruleoannulata Sing. ex Guzmán (Myc) in press *
caerulescens Murr. 1923 (M 15): 20 *
caerulescens (Naematoloma) Pat. 1907 (BSF 23): 78 =
Psilocybe cubensis var. caerulescens (Pat.) Sing. &
 Smith
caerulescens, Ag. semilanceata var., Cke 1881-91 (IBF): 605,
 pl. 573 = Psilocybe cookei Sing. non Sacc.
caerulescens, P. cubensis var., (Pat.) Sing. & Smith 1958
 (M 50): 269
caerulescens, P. semilanceata var., (Cke.) Sacc. 1887
 (SF 5): 1051 = P. semilanceata (Fr. ex Secr.) Kumm.
 var. semilanceata
caerulescens (Stropharia) Imai 1932 (TSn 12): 148 =
Psilocybe venenata (Imai) Imazeki & Hongo
caerulipes (Peck) Sacc. 1887 (SF 5): 1051 *
caesioannulata Sing. 1965 (Myp 26): 165 *
caespitosa, P. squalidella var., Peck 1906 (ANS 59): 55 =
Naematoloma squalidellum (Peck) A.H. Smith
caespitosa (Berk.) Sacc. 1887 (SF 5): 1053 = Psathyrella sp.
caespitosa Murr. 1923 (M 15): 5
californica Earle 1904 (BNb 3): 301 = Psilocybe crobula
 (Fr.) Lange ex Sing. ?
callosa (Fr.) Qué. 1872 (CJV): 257 *?
camptopoda (Peck) Sacc. 1887 (SF 5): 1057 = Psathyrella
camptopoda (Peck) A.H. Smith
candidipes Sing. & Smith 1958 (M 50): 141 *
canificans Cke., in Sacc. 1887 (SF 5): 1047 = Psilocybe
canofaciens Cke.
canobrunnea (Fr. ex Batsch) Qué. 1872 (CJV): 257; doubtful
 sp.
canofaciens Cke. 1885 (G 14): 1; doubtful sp.
canoruber (B. & C.) Sacc. 1887 (SF 5): 1052 = Agaricus sp.
carbonaria Sing. 1965 (Myp 26): 166 *?
caricicola Orton 1969 (NED 29): 119 = Melanotus
caricicola (Orton) Guzmán, comb. nov.
castaneicolor Murr. 1923 (M 15): 19 = Psathyrella
conopilea (Fr.) Pears. & Dennis
castaneifolia Murr. 1923 (M 15): 17 = Psathyrella
castaneifolia (Murr.) A.H. Smith
castanella Peck 1888 (BNS 1): 7 = Psilocybe crobula
 (Fr.) Lange ex Sing. ?
caterinata Mass. 1892 (BF 1): 378 = Psathyrella caterinata
 (Mass.) Orton
cavipes House 1919 (BNS 205-6): 40; doubtful sp.
ceres (Cke. & Mass.) Sacc. 1891 (SF 9): 140; doubtful sp.
cernua (Vahl ex Fr.) Qué. 1872 (CJV): 147 = Psathyrella
cernua (Vahl ex Fr.) Moser
chilensis Sing. 1965 (Myp 26): 168

- chondrodermus (B. & Br.) Sacc. 1887 (SF 5): 1048 =
Psathyrella chondrodermus (B. & Br.) A.H. Smith
chrysocystidiata Sing. 1973 (BS 7): 82
cinchonensis (Psathyra) Murr. 1918 (M 10): 33 = Psilocybe
mammillata (Murr.) A.H. Smith
citrina Mass. 1901 (BmI 175-7): 162 = Psathyrella sp.
clivensis (B. & Br.) Sacc. 1887 (SF 5): 1055 =
Psathyrella clivensis (B. & Br.) Orton
cokeri Murr. 1923 (M 15): 12 = Psathyrella cokeri (Murr.)
A. H. Smith
cokeriana Smith & Hesler 1946 (JMS 62): 193
collybioides Sing. & Smith 1958 (M 50): 141 *
colombiana Guzmán 1977 (Myc) in press *
compta (Fr.) Sacc. 1887 (SF 5): 1050 = Ag. (Psilocybe)
comptulus B. & Br. ?
comptulus, Ag. (Psilocybe) B. & Br. 1861 (NBF): 376, #917;
doubtful sp.
conica (Psathyra) Peck 1901 (BMH 54): 153 = Psilocybe sp.
conissans Peck 1908 (BNS 122): 132 = Psathyrella
conissans (Peck) A.H. Smith
cookei Sacc. (non Sing.) 1887 (SF 5): 1043; doubtful sp.
cookei Sing. (non Sacc.) 1973 (BS 7): 84 = Psilocybe
semilanceata (Fr. ex Secr.) Kumm. var. semilanceata
coprinifasciens (Roll.) Pouz. 1953 (CM 7): 140
coprophila (Bull. ex Fr.) Kumm. 1871 (FP): 71
cordispora Heim 1959 (RM 24): 103 *
cordobensis Sing. 1973 (BS 7): 83
corneipes (Fr.) Karst. 1879 (BFI 32): 504; not a Psilocybe.
crobula (Fr.) Lange ex Sing. 1961 (Sy 15): 70
cubensis (Earle) Sing. 1948 (Sy 2): 37 *
cyanescens (Geophila) (Maire) Kühn. & Romagn. 1953 (FAC):
337 = Psilocybe mairei Sing.
cyanescens Wakef. 1946 (TBS 29): 141 *
cyanescens (Stropharia) Murr. 1941 (M 33): 279 = Psilocybe
cubensis (Earle) Sing.
cylindrispora Pears. 1950 (TBS 33): 306; doubtful sp.
cystidiosa Peck 1913 (BNS 167): 46 = Psathyrella
cystidiosa (Peck) A.H. Smith
deformata, P. squalidella var., Peck 1912 (BNS 157): 98 =
Naematoloma udum (Pers. ex Fr.) Karst.
delita (Britz.) Sacc. 1887 (SF 5): 1046; doubtful sp.
depauperata (Pholiota) (Sing. & Smith) A.H. Smith 1968
(NAP): 121 = Psilocybe sp. ?
desertorum Vel. 1921 (Ch 3): 589; doubtful sp.
dichroa (Pers.) Karst. 1879 (BFI 32): 504 = Psilocybe
atrobrunnea (Lasch) Gill.
dichroma (B. & C.) Sacc. 1887 (SF 5): 1057 = Psathyrella
dichroma (B. & C.) A.H. Smith
diconica, P. yungensis var., Sing. & Smith 1958 (M 50): 142*
digressus Peck 1895 (BTC 22): 205 = P. coprophila (Bull. ex
Fr.) Kumm. ?
discordabilis (Britz.) Sacc. 1895 (SF 11): 72; doubtful sp.
discordans (Britz.) Sacc. 1887 (SF 5): 1049; doubtful sp.
dispersa Heim 1957 (ChE 2): 465 = Naematoloma dispersum
(Fr.) Karst.

- distorta-intermedia, P. mexicana f., Heim & Cailleux 1967 (NIC): 140 = P. mexicana Heim f. mexicana dumontii Sing. ex Guzmán 1977 (Myc) in press *
dunicola (Speg.) Sing. 1968 (Myp 34): 137
- ecbola (Fr.) Sing. 1969 (BnH 29): 254 = Psilocybe inquilina (Fr. ex Fr.) Bres.
- echinata Clel. 1934 (TPR 58): 212; doubtful sp.
- elongata, P. zapotecorum var., Heim 1960 (CrA 250): 1158 = P. zapotecorum Heim var. zapotecorum
- elongata (Pers.) Lange 1939 (FaD 4): 78 = Naematoloma elongatipes (Peck) Sing. ?
- elongatipes (Peck) Sacc. 1887 (SF 5): 1046 = Naematoloma elongatipes (Peck) Sing.
- ericaea (Pers. ex Fr.) Quél. 1873 (CJV): 349 = Naematoloma ericaeum (Pers. ex Fr.) Sing.
- eucalypta Guzmán & Watling 1977 (NED) in press *
- examinata (Deconica) (Britz.) Sacc. 1895 (SF 11): 73; doubtful sp.
- exerrans (Britz.) Sacc. 1887 (SF 5): 1056; doubtful sp.
- exigua, (Stropharia) merdaria var., Möller 1945 (FuF 1): 196 = Psilocybe merdaria (Fr.) Ricken
- fagicola Heim 1959 (RM 24): 438 *
- farinacea Rick ex Guzmán (Myc) in press *
- farinulenta (Schaeff. ex Fr.) Sacc. 1916 (Fic 15): 829 = Psathyrella cernua (Vahl ex Fr.) Moser ?
- fasciata Hongo 1957 (JJB 32): 144 *
- ferrugineo-lateritia (Vogl.) Sacc. 1891 (SF 9): 141; doubtful sp.
- fibrillosa (Pers.) P. Henn. 1900 (NPF 1 (1**)): 235 = Psathyrella fibrillosa (Pers.) Maire, in Maire & Wern.
- finetaria (Orton) Watling 1967 (L1 30): 150 (= Psilocybe finetaria (Orton) Sing.)*
- fimicola Guzmán 1977 (Myc) in press
- flaccescens, Ag. (Psilocybe) Schulz. 1876 (VZB): 418; doubtful sp.
- flammuliformis Sing. 1969 (BnH 29): 247
- floccipes Kill. 1936 (DbA 20): 78; doubtful sp.
- floridana Murr. 1944 (PF1 7): 126 = Psathyrella sp.
- foenisecii (Pers. ex Fr.) Quél. 1872 (CJV): 117 = Panaeolus foenisecii (Pers. ex Fr.) Kühner
- fortunata (Cke.) Sacc. 1887 (SF 5): 1056 = Panaeolus antillarum (Fr.) Dennis
- frustulenta (Fr.) P. Henn. 1900 (NPF 1 (1**)): 235 = Psathyrella frustulenta (Fr.) A.H. Smith
- fuegiana (Horak) Sing. 1969 (BnH 29): 256
- fuliginosa (Murr.) A.H. Smith 1948 (M 40): 697
- furtadonensis Guzmán 1977 (Myc) in press *
- fuscofolia Peck 1912 (BNS 157): 100 = Psathyrella fuscofolia (Peck) A.H. Smith
- fuscofulva Peck 1888 (BNS 1): 7 = Psilocybe atrobrunnea (Lasch) Gill.
- galericulata-convexa, P. mexicana f., Heim & Cailleux 1967 (NIC): 138 = P. mexicana Heim f. mexicana
- galericulata-viscosa, P. mexicana f., Heim & Cailleux 1967 (NIC): 143 = P. mexicana Heim f. mexicana
- gastonii, P. caerulipes var., Sing. 1958 (Sy 12): 236 *

- gilletii Karst. 1879 (Bfi 32): 509 = Naematoloma sp.
goniospora (B. & Br.) Sing. 1961 (Sy 15): 70
gossypina (Bull.) P. Henn. 1900 (NPF 1 (1**)): 235 =
Psathyrella gossypina (Bull. ex Fr.) Konr. & Maubl.
graminicola (Orton) Sing. 1973 (BS 7): 83
grandis-gibbosa, P. mexicana f., Heim & Cailleux 1967
(NIC): 145 = P. mexicana Heim f. mexicana
granulata Naveau 1923 (NT 5): 85; doubtful sp.
graveolens Peck 1913 (BNS 167): 47

hebes (Fr.) Sacc. 1887 (SF 5): 1054 = Psathyrella
obtusata (Fr.) A.H. Smith
heliophila, P. caerulescens var. mazatecorum f., Heim 1958
(ChM): 141 = P. caerulescens Murr. var. caerulescens
helobia (Kalchbr.) P. Henn. 1900 (NPF 1 (1**)): 235;
doubtful sp.
helvola (Schaeff.) Mass. sensu Rea (BB): 362; doubtful sp.
henningsii Jungner 1906 (ZPk 16): 131; doubtful sp.
heterosticha (Fr.) Sing. 1969 (BnH 29): 248
hoogshageni Heim 1959 (RM 24): 104 *
horaki Guzmán 1977 (Myc) in press
hydrophila (Bull. ex Fr.) Gill. 1878 (LH): 583 =
Psathyrella hydrophila (Bull. ex Fr.) R. Maire
hygrophila, P. spadicea var., Mass. 1892 (BF): 374 =
Psathyrella hydrophila (Bull. ex Fr.) R. Maire ?
hyperella (Fr.) Kühn. & Romagn. 1953 (FAC): 339; doubtful
sp.
inconspicua Guzmán & Horak 1978 (Sy 30) in press *
inquilina (Fr. ex Fr.) Bres. 1931 (ICM): 18, pl. 863
insiliens (Britz.) Sacc. 1887 (SF 5): 1049; doubtful sp.
insipidus, Ag. (Psilocybe) Schulz. 1881 (VZB 30): 487;
doubtful sp.
interjungens (Britz.) Sacc. 1887 (SF 5): 1055; doubtful sp.
iodoformica Pat. 1924 (BMH 6): 531; doubtful sp.
isauri Sing. 1958 (Sy 12): 237 *
jujuyensis Sing. 1973 (BS 7): 82
kumaenorum Heim 1967 (RM 32): 206 *

larga Kauffm. 1918 (AgM): 279 = Psathyrella larga (Kauffm.)
A.H. Smith
lateritia (Murr.) A.H. Smith 1948 (M 40): 698 = Psilocybe
montana (Pers. ex Fr.) Kumm. ?
latispora Murr. 1923 (M 15): 10
lazoii Sing. 1969 (BnH 29): 242
leechii A.H. Smith 1946 (JMS 62): 196 = Agrocybe leechii
(A.H. Smith) Watling
libertatis (Deconica) (Batsch. ex Fr.) Sacc. 1887 (SF 5):
1059; doubtful sp.
limicola (Peck) Sacc. 1887 (SF 5): 1054 = Psathyrella
limicola (Peck) A.H. Smith
limophila (Peck) Peck 1912 (BNS 157): 104 = Psathyrella
limophila (Peck) Guzmán, comb. nov.
liniformans Guzmán & Bas 1977 (Pe) in press *
lipophila (Oudem.) Sacc. 1902 (SF 16): 125; doubtful sp.
lonchophorus, Ag. (Naucoria) B. & Br. 1871 (JLS 11): 544 =
Psilocybe sp.

- longingua Sing. 1959 (M 51): 578
longipes, P. agraria var., Kill. 1936 (DbA 20): 72;
 doubtful var.
longipes, P. atrorufa f., Kill. 1936 (DbA 20): 77
longispora Murr. 1945 (JFA 8): 197 = Naematoloma
 longispora (Murr.) A.H. Smith
longispora, P. mexicana var., Heim 1956 (CrA 242): 1393 =
 Psilocybe aztecorum Heim
luteonitens (Vahl ex Fr.) Parker-Rhodes 1951 (TBS 34): 364
lysiophylla (Fr.) Sacc. 1887 (SF 5): 1045; doubtful sp.
- macrocystis Heim 1956 (CrA 242): 1392; nom. nud.
macrosperma, P. aqualidella var., Peck 1912 (BNS 157): 98 =
 Naematoloma udum (Pers. ex Fr.) Karst.
macrospora, P. merdaria var., (Möller) Sing. 1969 (BnH 29):
 243
mairei Sing. 1973 (BS 7): 84 *
major, P. hebes f., Bres. sensu Kill. 1936 (DbA 6): 75 =
 Psathyrella sp. ?
mammillata (Murr.) A.H. Smith 1948 (M 40): 700 *?
marthae Sing. 1969 (BnH 29): 255
maxima Vel. 1921 (Ch 3): 584; doubtful sp.
mazatecorum, P. caerulescens var., Heim 1957 (RM 22): 78 =
 Psilocybe caerulescens Murr. var. caerulescens
merdaria (Fr.) Ricken 1915 (Bl): 251
merdicola Huijsman 1961 (Pe 2): 93
mesospora Sing. 1969 (BnH 29): 245
mexicana Heim 1957 (RM 22): 77 *
microrhiza (Lasch) P. Henn. 1900 (NPF 1 (1**)): 235 =
 Psathyrella microrhiza (Lasch) Konr. & Maubl.
microsperma Speg. 1919 (BCo 23): 402 = Psathyrella
 microsperma (Speg.) Guzmán, comb. nov.
microspora, P. semilanceata var., Sing. 1969 (BnH 29): 247
 = Psilocybe pelliculosa Sing. & Smith
minor, P. fatua f., Pereira-Coutinho 1934 (BSb 9): 209 =
 Psathyrella fatua Fr.
mixaeensis Heim 1959 (RM 24): 104 *
modesta (Peck) A.H. Smith 1948 (M 40): 700
moelleri Guzmán 1977 (Myc) in press
montana (Pers. ex Fr.) Kumm. 1871 (FP): 71
muliercula Sing. & Smith 1958 (M 50): 142 *
murcida (Fr.) Karst. 1879 (Bfi 32): 507; doubtful sp.
musci Clal. & Cheel 1918 (TPR 42): 131; doubtful sp.
muscorum (Orton) Moser 1967 (KK): 239
mutabilis Karst. 1890 (SyF 29): 101 = Naematoloma sp.
mutans McKnight 1971 (BTC 98): 4
myosotis, Ag. (Psilocybe) Fr. 1821-23: 290 = Pholiota
 myosotis (Fr.) Sing.
- naematolomiformis Guzmán 1977 (BnH) in press
naviculata-viscosa, P. mexicana f., Heim & Cailleux 1967
 (NIC): 144 = P. mexicana Heim f. mexicana
nemophila (Fr.) Gill. 1878 (LH): 586; doubtful sp.
neocaledonica Guzmán & Horak 1978 (Sy 30) in press *
nigrella Peck 1910 (BNS 139): 28
nigripes, P. caerulescens var., Heim 1957 (RM 22): 79 *
nitidipes (Peck) Morgan 1907 (JMy): 253; doubtful sp.

- nolitangere (Fr.) P. Henn. 1900 (NPF 1 (1**)): 235 =
Psathyrella nolitangere (Fr.) Pears. & Dennis
notha (Deconica) (Britz.) Sacc. 1887 (SF 5): 1060;
doubtful sp.
nothofagensis Guzmán & Horak 1978 (Sy 30) in press
novae-zelandiae Guzmán & Horak 1978 (Sy 30) in press
nuciseda (Fr.) Rea 1922 (BB): 366; doubtful sp.
- obscura Peck 1897 (BTC 24): 144 = Psathyrella obscura
(Peck) Guzmán, comb. nov.
obtusata (Fr.) Kumm. 1871 (FP): 71 = Psathyrella obtusata
(Fr.) A.H. Smith
obtusissima Kauffm. & Smith 1932 (PMi 17): 194
ochraeceps Kauffm. 1925 (PMi 5): 143 = Naematoloma
dispersum (Fr.) Karst.
ochreatus, Ag. (Psathyra) B. & Br. 1871 (JLS 11): 555 =
Psilocybe sp. ?
oedipus Mass. 1899 (BmI 153-4): 178
olivaceotincta Kauffm. 1925 (PMi 5): 144 = Naematoloma
olivaceotincta (Kauffm.) A.H. Smith
ombrophila, P. caerulescens var., Heim 1973 (RM 37): 183 =
P. caerulescens Murr. var. caerulescens
omnium-sanctorum Sing. 1969 (BnH 29): 249
orizabensis Murr. 1918 (M 10): 29 = Psathyrella orizabensis
(Murr.) A.H. Smith
- pallidisporea (Murr.) A.H. Smith 1948 (M 40): 701
palmigena (B. & C.) Sacc. 1887 (SF 5): 1049 = Psathyrella
palmigena (B. & C.) Guzmán, comb. nov.
panaeoliformis Murr. 1923 (M 15): 12
papuana Guzmán & Horak 1978 (Sy 30) in press *
papyracea (Bolt.) Lange 1939 (FaD 4): 78 = Psathyrella sp.
parabilis (Deconica) Britz. 1883 (DM): 174; doubtful sp.
particularis Britz. 1883 (DM): 174; doubtful sp.
parviducta (Britz.) Sacc. 1895 (SF 11): 72; doubtful sp.
paupera Sing. 1955 (Sy 9): 404 *
peckianum (Hypholoma) Kauffm. 1918 (AgM 1): 258 =
Psilocybe sp.
pediades, Ag. (Psilocybe) Fr. 1821-23: 290 = Agrocybe
pediades (Fr.) Fayod
peladae Sing. 1969 (BnH 29): 254
pelliculosa (A.H. Smith) Sing. & Smith 1958 (M 50): 280 *
pellosperma Vogl., per Laplanche 1894 (DCs): 299;
doubtful sp.
pennata (Fr.) Pereira-Coutinho 1931 (BSb 7): 340 =
Psathyrella pennata (Fr.) Konr. & Maubl.
percevalii (B. & Br.) Orton 1969 (NED 29): 80
pertinax (Fr.) Sacc. 1887 (SF 5): 1044; doubtful sp.
peruviana Sing. 1959 (M 51): 583
phillipsii (Geophila) (B. & Br.) Kühn. & Romagn. 1953
(FAC): 339 = Melanotus phillipsii (B. & Br.) Sing.
phoenix (Fr.) Gill. 1878 (LH): 583; doubtful sp.
phyllogena (Peck) Peck 1912 (BNS 157): 99
physaloides (Bull. ex Mérat) Qué. 1872 (CJV): 256;
doubtful sp.
pintonii Guzmán 1977 (Myc) in press *

- plana Rick 1930 (Bro 24): 113 = Psathyrella plana (Rick) Guzmán, comb. nov.
plutonia (B. & C.) Sacc. 1887 (SF 5): 1056 *?
polycephala (Paulet ex Fr.) Peck 1912 (BNS 157): 55 = Psathyrella polycephala (Paulet ex Fr.) A.H. Smith
polytrichi (Fr.) Sacc. 1887 (SF 5): 1046 = Naematoloma polytrichi (Fr.) Konr.
polytrichi, P. uda var., Gill. 1878 (LH): 586 = Naematoloma udum (Pers. ex Fr.) Karst.
polytricophila (Peck) A.H. Smith 1948 (M 40): 703
praelonga, Ag. (Psilocybe) antillarum var., Fr. sensu Murr. 1918 (M 10): 33 = Panaeolus antillarum (Fr.) Dennis ?
praetervisa Sing. 1969 (BnH 29): 244
pratensis Orton 1969 (NED 29): 120
pteridophytorum Sing. 1959 (M 51): 582
pulicosa (Mont.) Sacc. 1887 (SF 5): 1056 = Psathyrella pulicosa (Mont.) Guzmán, comb. nov.
pyrispora (Murr.) A.H. Smith 1948 (M 40): 703

quebecensis Ola'h & Heim 1967 (Nca 94): 574 *
recognita (Britz.) Sacc. 1895 (SF 11): 72; doubtful sp.
reflexa-conica, P. mexicana f., Heim & Cailleux 1967 (NIC): 138 = P. mexicana Heim f. mexicana
rhodophae (Mont.) Sacc. 1887 (SF 5): 1050 = Psathyrella rhodophae (Mont.) Guzmán, comb. nov.
rhombispora (Britz.) Sacc. 1895 (SF 11): 72
rhombispora (Stropharia) Höhnelt 1903 (Am 1): 393 = Psilocybe sp.
rhomboidospora (Deconica) Atk. 1909 (Am 7): 368 = Psilocybe sp.
rugosa Vel. 1921 (Ch 3): 586; doubtful sp.

sabulosa Peck 1897 (BTC 24): 144
sarcocephala (Fr.) Gill. 1878 (LH): 586 = Psathyrella sarcocephala (Fr.) Sing.
scatigena (Deconica) (B. & C.) Sacc. 1887 (SF 5): 1058 = Psilocybe sp.
schoeneti Bresins. 1976 (Ho 35): 104
sclerotifera (Speg.) Sing. 1969 (BnH 29): 240 *?
scobicola (B. & Br.) Sacc. 1887 (SF 5): 1048 = Naematoloma scobicola (B. & Br.) Guzmán, comb. nov.
sellae Bres. & Matt. 1908 (AB 7): 145; doubtful sp.
semilanceata (Fr. ex Secr.) Kumm. 1871 (FP): 71 *
semistriata (Deconica) Peck 1898 (ANS 51): 291 = Psilocybe montana (Pers. ex Fr.) Kumm.
semivestita (B. & Br.) P. Henn. 1900 (NPF 1 (1**)): 235 = Psathyrella semivestita (B. & Br.) A.H. Smith
semperviva Heim & Cailleux 1958 (RM 23): 352 *
senex Peck 1888 (ANS 41): 70 = Psathyrella senex (Peck) A. H. Smith
septembris (Sing.) Sing. 1973 (BS 7): 83
sepulchrorum (Deconica) Zoll. 1847 (Fl): 306; doubtful sp.
serbica Moser & Horak 1969 (ZP 34): 138 *
sierrae Sing. 1969 (BnH 29): 240 *
silvatica (Peck) Sing. & Smith 1958 (M 50): 277 *
simulans (Karst.) Sacc. 1887 (SF 5): 1055; doubtful sp.

- singeri Guzmán 1977 (BnH) in press *
sordida (Deconica) (Speg.) Sing. 1950 (L 23): 214 =
Agrocybe sp.
spadicea (Schaeff. ex Fr.) Kumm. 1871 (FP): 71 =
Psathyrella spadicea (Schaeff. ex Fr.) Sing.
spadiceo-grisea (Fr.) Boud. 1905-10 (Im 4): 68 =
Psathyrella spadiceo-grisea (Fr.) Maire
sphagnicola A.H. Smith 1946 (JMS 62): 197
squalens (Fr.) Sacc. 1887 (SF 5): 1054; doubtful sp.
squalidella (Peck) Peck 1893 (ANS 46): 55 =
Naematoloma squalidellum (Peck) A.H. Smith
squamosa (Pers. ex Fr.) Orton 1969 (NED 29): 80
squarrosipes Sing. 1959 (M 51): 580
stagnina (Fr.) Lange 1957 (MG 148): 65 = Phaeogalera
stagnina (Fr.) Kühn. 1972 (BSF 88): 144
stercicola Clel. 1927 (TPR 51): 305 = Naematoloma sp.
strictipes Sing. & Smith 1958 (M 50): 141 *
stuntzii Guzmán & Ott 1976 (M 68): 1261 *
subaeruginascens Höhnelt 1914 (SAW 123): 78 *
subaeruginosa Clel. 1927 (TPR 51): 305 *
subagraria Atk. (Am 7): 375 = Psathyrella subagraria
 (Atk.) A.H. Smith
subammophila Clel. 1927 (TPR 51): 306; doubtful sp.
subbrevipes A.H. Smith & Hesler 1946 (JMS 62): 195
subcaerulipes Hongo 1958 (JJB 33): 44 *
subcoprophila (Britz.) Sacc. 1895 (SF 11): 72
subcubensis Guzmán 1977 (Myc) in press *
subericaea (Fr.) Sacc. 1887 (SF 5): 1045 = Naematoloma
subericaeum (Fr.) Sing.
subhyperella Sing. 1973 (BS 7): 83
submaculata Atk. 1909 (Am 7): 375 = Psathyrella
submaculata (Atk.) A.H. Smith
subuda (Britz.) Sacc. 1895 (SF 11): 72 =
Naematoloma udum (Pers. ex Fr.) Karst. ?
subuda Clel. 1934 (TPR 58): 212; doubtful sp.
subviridis (B. & C.) Sacc. 1887 (SF 5): 1051 =
Naematoloma subvirida (B. & C.) A.H. Smith
subviscida (Peck) Kauffm. 1918 (AgM): 275
subyungensis Guzmán 1977 (Myc) in press *
sullivantii (Mont.) Sacc. 1887 (SF 5): 1047 =
Psathyrella sullivantii (Mont.) Guzmán, comb. nov.
taediosa (Kalch.) Sacc. 1887 (SF 5): 1044; doubtful sp.
tasmaniana Guzmán & Watling 1977 (NED) in press *
tegaris (Schum. ex Fr.) Gill. 1878 (LH): 585;
 doubtful sp.
tenax (Geophila) (Fr.) Kühn. & Romagn. 1953 (FAC): 338;
 doubtful sp.
testaceo-fulva (Britz.) Sacc. 1887 (SF 5): 1049;
 doubtful sp.
thrausta (Schulz. ex Kalch.) Bon 1969 (BSF 85); pl. 182
tibetensis Mass. 1906 (BmI 4): 93 = Agrocybe tibetensis
 (Mass.) Guzmán, comb. nov.
togoënsis P. Henn. 1891 (EBJ 14): 353; doubtful sp.
tomentosa (Murr.) A.H. Smith 1948 (M 40): 705
torpens (Fr.) Pereira-Coutinho 1931 (BSb 7): 340 =
Psathyrella torpens Fr. ?

- tortipes Speg. 1898 (ABA 6): 151 = Naematoloma tortipes (Speg.) Guzmán, comb. nov.
tortipes Speg. sensu Rick 1961 (Ih 8): 438 = Naematoloma subumbonatescens (Murr.) Sing.
tristis P. Henn. 1901 (H 40): 330; doubtful sp.
tropicalis (Deconica) Speg. 1891 (BCo 11): 429 = Agrocybe tropicalis (Speg.) Guzmán, comb. nov.
tuberosa (Karst.) Sacc. 1905 (SF 17): 90 = Psathyrella sp.
turficola Favre 1939 (BSF 55): 196 = Psilocybe atrobrunnea (Lasch) Gill.
uda (Pers. ex Fr.) Gill. 1878 (LH): 586 = Naematoloma udum (Pers. ex Fr.) Karst.
umbonata, P. squalidellus var., Peck 1912 (BNS 157): 98 = Naematoloma squalidellum (Peck) A.H. Smith
umbonatescens (Stropharia) (Peck) Sacc. 1887 (SF 5): 1021 = Psilocybe luteonitens (Vahl ex Fr.) Parker-Rhodes
umbrospora Vel. 1921 (Ch 3): 586; doubtful sp.
unicolor Peck 1900 (ANS 53): 845 = Psathyrella camptopoda (Peck) A.H. Smith
urticicola (B. & Br.) P. Henn. 1900 (NPF 1 (1**)): 235; doubtful sp.
uruguayensis Sing. ex Guzmán 1977 (Myc) in press
uspanapensis Guzmán 1977 (BnH) in press *
vaccinii, P. agrariella var., Charles 1931 (DAB 258): 12; doubtful var.
valdiviensis Sing. 1969 (BnH 29): 251
vanhoeffenii (P. Henn.) Sacc. 1912 (SF 21): 219; doubtful sp.
velifera (Geophila) Favre 1955 (Cza): 204 = Psilocybe crobula (Fr.) Lange ex Sing. ?
venenata (Imai) Imazeki & Hongo 1957 (JJB 32): 146 *
venezuelana Dennis 1961 (KB 15): 137
vernalis Vel. 1921 (Ch 3): 587; doubtful sp.
vialis Murr. 1923 (M 15): 11 = Naematoloma vialis (Murr.) Guzmán, comb. nov.
vicina (Fr.) Sacc. 1887 (SF 5): 1056; doubtful sp.
virescens Mass. 1892 (BF): 367; doubtful sp.
vomiticola, P. coprophila var., Kill. 1936 (DbA 20): 76
washingtonensis A.H. Smith 1946 (JMS 62): 199
wassonii Heim 1958 (RM 23): 119 = P. muliercula Sing. & Smith
weldenii Guzmán 1977 (BnH) in press *
wrightii Guzmán 1977 (Myc) in press *
xeroderma Huijsm. 1961 (Pe 2): 94
yungensis Sing. & Smith 1958 (M 50): 142 *
zapotecorum Heim 1957 (RM 22): 77 *
zonalis Vel. 1921 (Ch 3): 589; doubtful sp.

MYCOTAXON

Vol. VI, No. 3, pp. 477-480

January-March 1978

PSILOCYBE MAMMILLATA IN FLORIDA

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SUMMARY

Psilocybe mammillata a probably hallucinogenic fungus, is reported for the first time from the United States (Florida). It was previously known only from Jamaica. Discussions of the relationships of this species with P. fagicola, P. yungensis, P. cordispora, P. plutonia and P. hoogshageni are presented. All of these related species are known from Mexico or South America.

Psilocybe mammillata (Murr.) Smith has until now been known only from a subtropical forest at an elevation of 1,500 m, in Jamaica, where it was collected by Murrill and was described by him as Atylospora mamillata Murr. (Murrill, 1918). Later in the same paper he changed this species to the genus Psathyra. Smith (1948) studied Murrill's type and concluded that it was a Psilocybe. He also found that Psathyra cinchonensis (Murr.) Murr. (= Atylospora cinchonensis Murr.), from the same locality was synonymous with it. Studies on the types (in NY) of both of Murrill's species made by the senior author of the present paper confirmed the above synonymy.

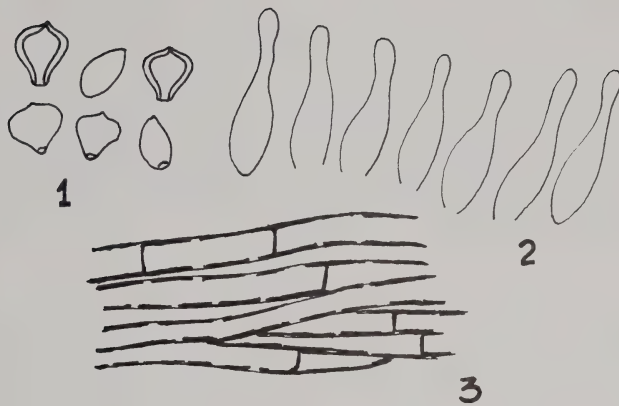
Psilocybe mammillata was collected by Thiers in Florida in 1958 and has been studied by the senior author. Thiers' material checks well with the type (Murrill 608, NY). This is the first record of P. mammillata in the United States and only the second report of this species in the literature.

The material studied from Florida: Thiers 5067 SFSU, Florida, Highlands Hammock State Park, Aug. 6, 1958, gregarious in humus along trail, has the following features: Pileus 10-15 mm broad and 10-15 mm high, conic-apiculate, brown, darker with age; stipe crooked, reddish brown with white spots toward the subbulbous base; both pileus and stipe seem slightly bluing to darker. The spores are (4.9) 5.5-6.5 (8) x 4.4-5.5 x 3.5-4 μ m, rhombic to subtriangular in face view, subelliptic in side view; walls thick, brown to yellowish in KOH, with a broad germ pore (Fig. 1). Cheilocystidia 12-17 x 4-5.5 μ m, abundant, forming a sterile band at the edge of the lamellae, hyaline, fusoid-ventricose with long necks 3.3-5 x 1-2.5 μ m (Fig. 2). Pleurocystidia none or similar to the cheilocystidia, near the edge of the lamellae. Subhymenium hyaline to brownish to brown-orangish, hyphae not incrustated, 3.3-5.5 μ m in diameter. Lamellar trama parallel, brownish to brownish orange, hyphae thick-walled, 6-15 μ m in diameter, irregularly incrustated (Fig. 3). Epicutis differentiated as a subgelatinous, thin layer of subhyaline to brownish-orange, incrustated hyphae. Hypodermium similar to the lamellar trama. Clamp connections common.

This fungus is closely related to the following hallucinogenic fungi: P. fagicola Heim, P. yungensis Sing. & Smith, P. cordispora Heim, and P. hoogshageni Heim, and with the probably hallucinogenic species P. plutonia (B. & C.) Sacc. It differs from these species, however, in the size of the spores and in shape and size of the cheilocystidia as in shown in Table 1.

All species related to P. mammillata have rhombic or subrhombic, thick-walled spores, conic or papillate pilei and context with brown-orangish pigment incrustated on the walls of the hyphae, and all grow in subtropical forests in America. These relationships have been established from a study of the types (in PC, MICH, NY and FH) and from an analysis of the related bibliography (Heim, 1959; Heim & Wasson, 1958; Singer & Smith, 1958, Smith, 1948 and Dennis, 1961) as well.

Psilocybe fagicola is only known from the State of Hidalgo in Mexico (Heim 1959) and differs from all of the above mentioned species, including P. mammillata, in the more or less rhizomorphic base of the stipe. P. yungensis, described from Bolivia (Singer & Smith, 1958) and from the State of Oaxaca in Mexico (Heim & Wasson, 1958), differs from the others in the irregular form of the cheilocystidia, which do not have necks. P. cordispora, P. hoogshageni and P. plutonia differ from P. mammillata in the size of the spores and cheilocystidia; the first two species are known only from the State of Oaxaca in Mexico (Heim & Wasson, 1958), and the last from Cuba and Venezuela (Dennis, 1961).



Figs. 1-3. Psilocybe mammillata (Murr.) Smith. 1. Spores. 2. Cheilocystidia. 3. Tramal hyphae. All from Thiers 5067.

Of the fungi mentioned so far, P. fagicola, P. yungensis, P. cordispora and P. hoogshageni are known to be hallucinogenic, but the hallucinogenic properties of P. mammillata and P. plutonia have not yet been demonstrated. The close resemblance of these two species to the others, however, as well as the dark color of their pilei and stipes seemingly resulting from the bluing of fresh specimens, make it very probable that they also are hallucinogenic.

Table 1. Comparison of Psilocybe mammillata (1) with its related species: P. fagicola (2), P. yungensis (3), P. cordispora (4), P. plutonia (5) and P. hoogshageni (6)

spores	cheilocystidia
1 (4.9-)5.5-6.5(-8) μm long.	12-17 x 4-5.5 μm
2 (4.9-)5.5-6(-6.5) μm long.	6-13 x 2.5-3.3 μm
3 (4.4-)5-6(-6.6) μm long.	16-27.8 x 4-5 μm
4 (5-)5.5-7(-8.8) μm long.	25-35 x 5-6 μm
5 (3.7-)4.5-6.7 μm long.	20-30 x 5-10 μm
6 (4.9-)6.5-7.7(-9.6) μm long.	16.5-27 x 4.4-6.6 μm

Acknowledgements

The senior author expresses his thanks to Guggenheim Memorial Foundation for the Grant to support his research on Psilocybe. The authors also express their gratitude to the curators and directors of the herbaria (FH, MICH, NY and PC) who kindly loaned type species material of the species discussed in this paper. Dr. A.H. Smith and Dr. D. Stuntz kindly reading the manuscript.

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MYCOTAXON

Vol. VI, No. 3, pp. 481-496

January-March 1978

HOST-GENUS KEYS TO THE HYPODERMATACEAE OF CONIFER LEAVES

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SUMMARY

Universal keys to the described hypodermataceous fungi attacking conifer leaves are presented. They are arranged alphabetically by host-genus. Host species are listed under the keyed-out fungus species. Pertinent literature is cited which enables one to find taxonomic descriptions of the fungus species. The keys make diagnosis of hypodermataceous fungi more rapid.

INTRODUCTION

The keys, originally adapted from Darker's (1932) fungus species keys, have been arranged by host genus and have been modified to keep pace with taxonomic developments. Although we have retained the commonly used family name, Hypodermataceae, it may be more phylogenetically correct to place these species in the tribe Hypodermateae of the Rhytismataceae (Korf 1973).

The keys follow Darker's (1967a) species concepts and include all those described. Taxonomic descriptions of species can be found in Darker (1932, 1967a) or in the references cited in the key after the species. Measurements given in parenthesis are consistent deviations recorded from published sizes.

After each keyed-out species, the hosts are listed, except where this list would be long, such as with Lophodermium pinastri. Hosts, in addition to the taxonomic

citings, are derived from Teng (1936), Durrieu (1957), Benito Martinez and Torres Juan (1965), Ouellette and Magasi (1966), Czabator et al. (1971), Shaw (1973) and our own records. Some personal comments by Darker on certain species are included as footnotes.

One should examine conifer leaves carefully for Hypodermataceae, because frequently other fungi are associated with Hypodermataceae, or fungi may be mistaken for Hypodermataceae. Ziller (1968) summarized these for Abies and Ziller and Funk (1973) for Pinus. To these, we add Darkera (Whitney et al. 1975) which occurs on Abies or Picea, and Lophophacidium (Reid and Cain 1962) on Picea. In addition, Hypodermataceae in different geographic areas likely have other fungal associates.

Abies

- (1) Ascomata nervisequious (averaging more than 5 times longer than wide); parasitic (2)

Ascomata elliptic to elongate (averaging less than 5 times longer than wide); saprophytic.....(10)
- (2) Spores 2-fusoid to 2-clavate (Isthmiella)..... (3)

Spores not 2-fusoid to 2-clavate (except rarely in Virgella robusta)..... (5)
- (3) Asci 4-spored, 14-16 μ wide; pycnidia lacking

Isthmiella quadrispora

 (on A. lasiocarpa)

Asci 8-spored, 20-30 μ wide; pycnidia in epiphyllous concolorous blisters (4)
- (4) Spores 35-45 μ long with isthmus 1-1.5 μ wide; pycnidia tend to be either side of the midrib Isthmiella abietis (on A. lasiocarpa)

Spores 45-55 μ long with isthmus 3-4 μ wide; pycnidia tend to be along the midrib.... Isthmiella faullii (on A. balsamea)

- (5) Spores 27-36 μ long, rarely slightly constricted in the middle.....Virgella robusta
(on A. amabilis, A. concolor, A. grandis, A. magnifica)
- Spores 68-110 μ long, not constricted in the middle.....(6)
- (6) Asci 4-spored; pycnidia punctiform.....Lirula punctata
(on A. amabilis, A. concolor, A. grandis,
A. lasiocarpa, A. mariesii, A. procera)
- Asci 8-spored; pycnidia in epiphyllous rows.....(7)
- (7) Spores 6-7 μ wide; pycnidia in 2 concolorous rows..... Lirula mirabilis
(on A. balsamea)
- Spores 2-5 μ wide; pycnidia in one row.....(8)
- (8) Pycnidial blisters in one concolorous row, rarely furcate; Europe, Japan; asci 95-135 μ long, spores 2-2.5 x 68-75 μ Lirula nervisequia
(on Abies spp.)
- Pycnidial blisters in one light brown to black row; North America; asci longer, 130-208 μ , spores wider..... (9)
- (9) Pycnidial blisters dark, becoming light to concolorous after sporulation; western North America; ascomata 0.5-1 mm wide, dark grey..Lirula abietis-concoloris
(on A. amabilis, A. concolor, A. grandis,
A. lasiocarpa, A. procera)
- Pycnidial blisters light, becoming dark after sporulation; eastern North America; ascomata 0.4-0.6 mm wide..... Lirula nervata
(on A. balsamea)
- (10) Spores 3-4 μ wide; subepidermal...Lophodermium decorum
(on A. grandis, A. lasiocarpa)
- Spores 1.5-3.0 μ wide; subcuticular or intraepidermal..... (11)

- (11) Follows nervisequious Hypodermataceae preventing or inhibiting formation of their hysterothecia; pycnidial states undescribed.....(12)

Not known to follow or inhibit other Hypodermataceae; pycnidial states described.....(13)

- (12) Ascomata amphigenous, black, subcuticular; spores 1.5-2.0 x 85-96 μ , septate in mature ascus when boiled in lactic acid; paraphyses uncinately-contorted Lophomerum autumnale
(on A. amabilis, A. balsamea, A. concolor, A. lasiocarpa, A. magnifica, A. procera)

Ascomata hypophyllous, dark grey, intraepidermal; spores 2-2.5 x 95-120 μ , not septate in mature ascus; paraphyses not uncinately Lophodermium consociatum
(on A. amabilis)

- (13) Ascomata subcuticular, elongate, over 2 mm long; mature paraphyses conspicuously helical, not swollen at tips..... Lophodermium uncinatum
(on A. amabilis, A. lasiocarpa)

Ascomata intraepidermal, elliptic, less than 2 mm long; mature paraphyses not conspicuously helical, slightly swollen at tips; not known on A. amabilis (14)

- (14) Ascus 12-16 μ wide; hysterothecia on evenly discolored needles without bands or lines, rarely amphigenous, 0.3-0.4 x 0.5-0.7 mm; pycnidia black Lophodermium lacerum
(on A. balsamea, A. grandis)

Ascus 10-12 μ wide; hysterothecia on light bands delimited by black lines, usually amphigenous, 0.4-0.8 x 0.6-1.9 mm; pycnidia concolorous with black margin..... Lophodermium piceae
(on A. alba, A. balsamea, A. concolor, A. lasiocarpa)

CedrusLophodermium cedrinum(on C. atlantica)Chamaecyparis

Ascomata subepidermal; asci 5-5.5 x 50-60 μ ; spores
 0.5-0.7 x 40-50 μ Lophodermium chamaecyparisii
 (on C. obtusa)

Ascomata subcuticular; asci 15-17 x 110-130 μ ;
 spores 2-3 x 70-90 μ Lophodermium juniperi
 (on C. thyoides)

Cunninghamia

- (1) On cone scales; spores 13-25 μ long, soon septate;
 paraphyses straight..... Hypoderma handelii
 (on C. lanceolata)

On foliage; spores 24-72 μ long, non-septate;
 paraphyses may be uncinata or forked.....(2)

- (2) Ascomata linearly arranged; spores bifusiform
 2.5-6.5 x 24-45 μ .. Soleella cunninghamiae (Saho and
 Zinno 1972)
 (on C. lanceolata)
 (= Bifusella cunninghamiicola Ogimi
 and Korf 1972)

Ascomata randomly arranged; spores
 tapered 1.5-2 x 56-72 μ Lophodermium petrakii
 (on C. lanceolata)

Fitzroya

Hypoderma pilgerodendri
 (Butin 1970)

(on F. cupressoides)

JuniperusLophodermium juniperi

(on J. communis, J. horizontalis, J. sabina,
J. scopulorum, J. virginiana)

Larix

Fruiting on fallen needles; ascus 8-spored, 9-11 μ wide; spores 1.5-2 μ wide; conidia bacillar; paraphyses uncinata; hysterothecia generally scattered
..... Lophodermium laricinum
(on L. decidua, L. laricina)

Fruiting on overwintered, attached needles; ascus mostly 4-spored, 20-24 μ wide; spores 6-6.5 μ wide; conidia elongated pyriform; paraphyses straight; hysterothecia more or less in a continuous row
..... Hypodermella laricis
(on L. laricina, L. occidentalis)

LibocedrusLophodermium juniperi

(on L. decurrens)

Picea

- (1) Spores distinctly 2-fusoid, 8-8.5 μ wide; asci 24-28 μ wide..... Isthmiella crepidiformis
(on P. engelmannii, P. glauca, P. mariana)

Spores filiform to clavate-filiform, 1-3.5 μ wide;
asci less than 24 μ wide..... (2)

- (2) Ascomata regularly nervisequious (typically more than 5 times longer than wide); spores 2.5-3.5 μ wide..... (3)

Ascomata elliptic or elongate, never nervisequious;
spores narrower..... (4)

- (3) Asci 100-132 (180) μ long; ascospores 56-68 (125) μ long..... Lirula macrospora
(on Picea spp.)

Asci 80-100 μ long; ascospores 25-35 μ long
 Lirula brevispora
 (Ziller 1969)

(on P. engelmannii, P. glauca)

- (4) Spores septate in mature ascus (Lophomerum Ouellette
 of Magasi)..... (5)

Spores aseptate in mature ascus..... (6)

- (5) Ascomata subcuticular..... Lophomerum septatum
 (on P. sitchensis)

Ascomata intraepidermal..... Lophomerum darkeri
 (on P. glauca)

- (6) Ascomata subepidermal; clypeus 165-180 μ thick; asci
 145-165 μ long; one collection from California
 only..... Lophodermium crassum
 (on P. breweriana)

Ascomata intraepidermal; clypeus 75-100 μ thick;
 asci 110-130 μ long; common and cosmopolitan; small
 hysterothecia generally produced on fallen foliage
 Lophodermium piceae
 (on Picea spp.)

Pilgerodendron

Asci > 175 μ long; 8-spored... Hypoderma pilgerodendri
 (Butin 1970)

(on P. uriferum)

Asci < 175 μ long; 4-spored..... Hypoderma heterosporum
 (Butin 1970)

(on P. uriferum)

Pinus

- (1) Ascomata inconspicuous to invisible, appearing brown
 to concolorous with needle surface.....(2)

Ascomata conspicuous, appearing brown, dark grey
 to black.....(9)

- (2) Ascomata small, 0.20-0.25 mm wide, dark brown, sub-epidermal; ascospores 20-23 μ long, slightly constricted in middle..... Ploioderma pedatum
(on P. radiata)

Ascomata wider, light brown to concolorous, subhypo-dermal; ascospores 23-90 μ long, not constricted in middle..... (3)

- (3) Ascospores 68-90 μ long (4)

Ascospores 23-60 μ long (5)

- (4) Ascomata 0.2-0.3 mm wide, brownish black, frequently fused laterally into compound hysterothecia
..... Lophodermella conjuncta
(on P. nigra, P. sylvestris)

Ascomata 0.3-0.6 mm wide, concolorous with needle surface, not fused laterally..Lophodermella cerina
(on P. contorta, P. elliottii, P. ponderosa,
P. taeda)

- (5) Ascomata 0.4-0.8 mm long, concolorous, at maturity usually forming shallow depressions or may be erumpent; ascospores (4) 6-8 x 45-60 μ
..... Lophodermella concolor
(on P. banksiana, P. contorta, P. sylvestris)

Ascomata averaging over 1 mm long, darker than needle, at maturity often forming depressions; ascospores 2.5-6 x 23-53 μ (6)

- (6) Ascus width 14-18 μ ; parasitic on 5-needle pines; ascospores 4-6 x 42-50 μ Lophodermella arcuata
(on P. albicaulis, P. lambertiana)

Ascus width 11-15 μ ; parasitic on 2- and 3-needle pines; ascospores 2.5-5 x 23-53 μ (7)

- (7) Ascomata width 0.55-0.68 mm; paraphyses septate, 2-3.5 μ diameter..... Lophodermella morbida
(Staley & Bynum 1972)
(on P. attenuata, P. ponderosa)

- Ascomata width 0.28-0.44 mm; paraphyses simple,
1 μ diameter.....(8)
- (8) Ascomata 2-20 mm long; asci 4- to 8-spored; spores
4-5 x 27-35 μ Lophodermella sulcigena
(on P. mugo, P. nigra, P. sylvestris)
- Ascomata 1-8 mm long; asci 8-spored; spores 3-4 x 40-
50 μ (ascomata often strongly erumpent!)
..... Lophodermella montivaga*
(on P. contorta, P. flexilis, P. monticola,
P. radiata, P. sylvestris)
- (9) Spores distinctly 2-fusoid or 2-clavate.....(10)
- Spores not distinctly 2-fusoid or 2-clavate.....(13)
- (10) Parasitic on 5-needle pines; ascomata 0.4-0.9 mm wide,
subcuticular, lacking paraphyses
..... Bifusella linearis
(on P. albicaulis, P. flexilis, P. monticola,
P. strobilus)
- Parasitic on 2- and 3-needle pines; ascomata 0.15-
0.30 mm wide, subepidermal, with paraphyses...(11)
- (11) Spores distinctly constricted in middle, 40-60 μ
long; paraphyses septate..... Soleella striiformis
(on P. coulteri, P. pinaster, P. sabiniana,
P. torreyana)
- Spores faintly constricted in middle, 20-52 μ long;
paraphyses septate or simple.....(12)
- (12) Spores 4-6 x 36-52 μ ; asci 125-180 μ long
..... Ploioderma lowei
(Czabator 1976)
(on P. elliottii)
- Spores 4-8 x 20-30 μ ; asci 108-128 μ long
..... Ploioderma pedatum
(on P. radiata)

* "May prove to be synonymous with L. sulcigena"
(G.D. Darker).

- (13) Spores septate in mature ascus..... (14)
 Spores not septate in mature ascus..... (16)
- (14) Asci 18-24 x 125-180 μ ; spores 4-6 μ wide..... (12)
 Asci 30-60 x 140-300 μ ; spores 6-18 μ wide..... (15)
- (15) Asci 40-60 x 280-300 μ ; spores 10-18 x 175-210 μ ;
 reported from Spain only....Elytroderma hispanicum*
 (on P. halepensis)
 Asci 30-45 x 140-240 μ ; spores 6-8 x 90-118 μ ; reported
 from North America only..... Elytroderma deformans
 (on Pinus spp.)
- (16) Asci characteristically 4-spored; spores over 4 μ
 wide..... (17)
 Asci characteristically 8-spored; spores varying in
 widths..... (18)
- (17) Asci 24-30 x 164-189 μ ; spores 8-11 x 28-32 μ ; sub-
 hypodermal..... Ploioderma hedgcockii
 (on Pinus spp., eastern North America)
 Asci 14-15 x 125-160 μ ; spores 4-4.5 x 33-45 μ ;
 subepidermal..... Davisomycella limitata
 (on P. radiata)
- (18) Ascomata lacking paraphyses; spores wide, 7.5-14 μ
 Bifusella pini
 (on P. flexilis, P. monophylla)
 Ascomata with paraphyses; spores narrow, < 7 μ wide
 (19)
- (19) Spores 3-7 μ wide (20)
 Spores 0.8-3 μ wide (33)

* "Probably synonymous with Elytroderma deformans as suggested to Torres" (G.D. Darker).

- (20) Spores under 60 μ long; slightly 2-clavate in some species..... (21)
- Spores over 60 μ long, not constricted in the middle..... (30)
- (21) Ascomata entirely subcuticular; pycnidia black, appearing similar to ascomata..... (22)
- Ascomata subepidermal (partly subcuticular in Meloderma desmazierii); pycnidia rare and concolorous..... (23)
- (22) Spores large, 6-7 x 35-45 μ Hypoderma mexicanum*
(Wolf 1951)
(on P. leiophylla)
- Spores small, 4-6 x 24-36 μ Bifusella saccata
(on P. albicaulis, P. edulis, P. flexilis)
- (23) Width of paraphyses 2-3.5 μ (24)
- Width of paraphyses 0.5-1.5 μ (25)
- (24) Spore sheath narrow, 2-4 μ (7)
- Spore sheath wide, 7 μ (30)
- (25) Ascomata light in color; spores frequently 2-clavate
..... Ploioderma pedatum
(on P. radiata)
- Ascomata dark; spores not constricted in the middle
..... (26)
- (26) Ascospores broadly clavate (Davisomycella)..... (27)
- Ascospores bacillar to fusiform, or slightly constricted in the middle (Meloderma, Ploioderma)
..... (28)

* "May be synonymous with Bifusella saccata" (G.D. Darker).

- (27) Ascomata on narrow brown zone in middle of green needle; asci 150-195 μ long; spores 24-38 μ long; subepidermal.... Davisomycella lacrimiformis (on P. attenuata)
- Ascomata not on brown zone of green needle; asci 87-102 μ long; spores 36-56 μ long; subcuticular in middle but subepidermal at margin
..... Davisomycella hiratsukae (on P. pumila)
- (28) Ascospores 4-6 x 36-52 μ (12)
- Ascospores 3-6 x 24-38 μ (29)
- (29) Ascomata elliptic, "surrounded typically by a narrow grayish zone"; primordium of slit obvious, bordered by papillate, concolorous cells; subepidermal to subcuticular; on 2-, 3- and 5-needle pines..... Meloderma desmazierii (on Pinus spp.)
- Ascomata elongate-fusoid, not surrounded by a grayish zone; no obvious primordium of slit; subepidermal; on 2- and 3-needle pines..... Ploioderma lethale (on Pinus spp., southeast U.S.A.)
- (30) Ascomata irregularly sinuous to bi-furcate; slit band distinct; paraphyses 2-3 μ wide; ascospores filiform, 3-4.5 x 120-170 μ
..... Davisomycella ponderosae (Staley 1964; Dubin & Staley 1969) (on P. ponderosa)
- Ascomata elliptic to fusiform, mostly on tawny areas of living needle; slit band not distinct; paraphyses 1-1.5 μ wide; ascospores clavate, 60-130 μ long..... (31)
- (31) Ascomata subepidermal to subhypodermal; spores attenuated in lower half..... Davisomycella medusa (on P. contorta, P. jeffreyi, P. ponderosa)
- Ascomata subepidermal; spores not attenuated in lower half..... (32)

- (32) On 1+ needles (needles 1 to 2 years old); asci maturing from May* onward..... Davisomycella ampla*
(on P. banksiana, P. contorta)
- On 2+ needles (needles 2 to 3 years old); asci maturing from July* onward.. Davisomycella montana*
(on P. contorta)
- (33) Ascomata with well-defined primordium of slit, subepidermal; on 2-, 3- and 5-needle pines.....(34)
- Ascomata without conspicuous primordium of slit; known on 5-needle pines only.....(36)
- (34) Ascomata long, 1-45 mm; frequently sinuous or bifurcate.....(30)
- Ascomata short, 0.8-2.0 mm; elliptic.....(35)
- (35) Labial band, pycnidia present. Spores not tapered and gelatinous sheath absent
..... Lophodermium pinastri
(on Pinus spp.)
= L. pini-pumilae**
(with asci 7-11 x 67-104 μ)
= L. pini-excelsae**
- Labial band, pycnidia absent. Spores tapered with gelatinous sheath..... Davisomycella fragilis
(Darker 1967b)
(on P. banksiana)
- (36) Ascomata 0.6-0.85 mm long; subcuticular; clypeus 15-37 μ thick; asci 11-13 μ wide; spores 2-3 μ wide; pycnidia conspicuous.... Lophodermium nitens
(on Pinus spp.)

* D. montana may prove to be synonymous with D. ampla: they are morphologically indistinguishable from each other and both were observed to mature in May in British Columbia on 1+ to 5+ year-old needles. See Ziller and Funk 1973.

** "Probably synonymous with Lophodermium pinastri" (G.D. Darker); but see Millar and Watson 1971, and Staley 1975, for additional information.

Ascomata 0.9-1.75 mm long; subepi- to subhypodermal;
 clypeus 60-75 μ thick; asci 8-9 μ wide; spores
 0.8-1.0 μ wide; pycnidia unknown
 Lophodermium durilabrum
 (on P. monticola)

Podocarpus

Hypoderma podocarpi
 (Butin 1970)

(on P. nubigenus, P. salignus)

Thuja

Asci sessile, 4-spored; spores 1.5-2 x 85-115 μ
 Lophodermium thujae
 (on T. occidentalis)

Asci pedicellate (pedicel 65-100 μ long), 8-spored;
 spores 3-4 x 19-25 μ Hypoderma thujae
 (on T. occidentalis)

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MYCOTAXON

Vol. VI, No. 3, pp. 497-499

January-March 1978

NIEBLA, A NEW GENERIC NAME FOR THE LICHEN GENUS DESMAZIERIA (Ramalinaceae)

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SUMMARY

The new generic name Niebla Rundel & Bowler is proposed to replace the genus name Desmazieria Mont., a homonym for the earlier described genus Desmazeria Dumortier (Poaceae). Thirteen taxa are transferred from Desmazieria and Ramalina into Niebla. One of these is the new combination Niebla robusta (R.H. Howe) Rundel & Bowler whose basionym is Ramalina combeoides Nyl. var. robusta R.H. Howe.

NIEBLA Rundel et Bowler, gen. nom. nov.

Desmazieria Mont., Ann. Sci. Nat. 18: 303. 1852.

Ramalina section Desmazieria (Mont.) Stizenb., Bericht
Thätigkeit St. Gallisch. naturw. Gesellsch. 176.
1862.

Ramalina section Corticatae Stnr. Oesterr. Botan.
Zeitschrift 54: 351. 1904.

Ramalina section Ellipsosporae series Desmazierae (Mont.)
R.H. Howe, Bryolologist 16: 67. 1913.

Ramalina subgenus Desmazieria (Mont.) Du Rietz, Svensk.
bot. Tidskr. 20(2): 1926.

Desmazieria section Desmazieria series Cylindricae Follm.
& Hun., Willdenowia 5: 207. 1969.

Desmazieria section Desmazieria series Complanatae Follm.
& Hun., Willdenowia 5: 207. 1969.

The generic name Desmazieria was proposed in 1852 by Montagne in honor of J.B.H.J. Desmazières (1796-1862), a French botanist. However, this generic name is a homonym

of a previous name, Desmazeria Dumortier, and is therefore illegitimate. Dumortier described the grass genus Desmazera in 1822 in honor of the same J.B.H.J. Desmazières. The following year he corrected the spelling to Desmazeria. Despite the opinions of Follmann (1976), the lichen genus Desmazieria Mont. is clearly an orthographic variant of the earlier Desmazeria Dumortier (Poaceae). It is very clear from the International Code of Botanical Nomenclature, therefore, that Desmazieria Mont. is a later homonym and is invalid. Since none of the species we consider to be included in this genus is the type of a validly described genus, we propose the new name Niebla for this group of species. Niebla comes from the Spanish word for fog or mist, an appropriate epithet for the ecological habitat of this group.

A world monograph of Niebla in preparation will discuss the generic limits of this group in detail (Rundel and Bowler, in prep.). Briefly, Niebla differs from Ramalina sens. str. by having principally palisade cell lines in the exterior cortex usually overlying supportive tissue, with chondroid supportive strands free in the medulla. The pycnidia in this genus are black and usually abundant. The spores are bilocular as are all genera in the Ramalinaceae. There are several variations in cortical type, ranging from a single layered cortex immersed in a gelatinous matrix, to a faint palisade array blending into a very thick supportive layer. Chondroid strands are not present as major structures in the medulla of some species aggregates. This anatomical variation is discussed in detail in our forthcoming monograph, and does not warrant further generic separation in our opinion. The majority of species of Niebla also share distinctive chemical similarities. Many species which have been placed in Desmazieria Mont. belong in Ramalina sens. str. or allied genera. Therefore, we propose here only new combinations for validly published taxa of Desmazieria and Ramalina which fit within our concept of Niebla. Complete discussions, keys, synonymies, and descriptions of new taxa will be included in our monograph.

Niebla bourgeana (Mont.) Rundel & Bowler, comb. nov.
 Basionym: Ramalina bourgeana Mont., Plant. Canar.
 1118. 1845. Synonym: Desmazieria bourgeana (Mont.)
 Follm., Philippia 3/2: 86. 1976.

Niebla cephalota (Tuck.) Rundel & Bowler, comb. nov.
 Basionym: Ramalina ceruchis (Ach.) De Not. f.
cephalota Tuck., Synops. N.A. Lich. 1: 21. 1832.
 Synonym: Desmazieria cephalota (Tuck.) Follm. & Hun.,
 Willdenowia 5: 208. 1969.

Niebla ceruchis (Ach.) Rundel & Bowler, comb. nov.
 Basionym: Parmelia ceruchis Ach., Method. Lich. 260.
 1803. Synonym: Desmazieria ceruchis (Ach.) Trev.,
 Flora 54: 51. 1861.

- Niebla combeoides* (Nyl.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina combeoides* Nyl., Bull. Soc. Linn. Normand., Ser. 2, 4: 107. 1870. Synonym: *Desmazieria combeoides* (Nyl.) Follm. & Hun., Willdenowia 4: 227. 1966.
- Niebla flaccescens* (Nyl.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina flaccescens* Nyl., Bull. Soc. Linn. Normand., Ser. 2, 4: 109. 1870. Synonym: *Desmazieria flaccescens* (Nyl.) Follm. & Hun., Willdenowia 5: 208. 1969.
- Niebla homalea* (Ach.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina homalea* Ach., Lich. Univ. 598. 1810. Synonym: *Desmazieria homalea* (Ach.) Mont., Ann. Sci. Nat. Bot., Ser. 3, 18: 304. 1852.
- Niebla josecuervoi* (Rundel & Bowler) Rundel & Bowler, comb. nov. Basionym: *Desmazieria josecuervoi* Rundel & Bowler, Bryologist 75: 505. 1972.
- Niebla maciformis* (Del.) Rundel & Bowler, comb. nov.
 Basionym: *Parmelia maciformis* Del., Descr. Egypte 2: 288. 1813. Synonyms: *Ramalina maciformis* (Del.) Bory, Dict. class. Hist. nat. 14: 458. 1828. *Desmazieria maciformis* (Del.) Follm., Philippia 3/2: 87. 1976.
- Niebla pulchri-barbara* (Rundel & Bowler) Rundel & Bowler, comb. nov. *Desmazieria pulchri-barbara* Rundel & Bowler, Bryologist 75: 505. 1972.
- Niebla robusta* (R.H. Howe) Rundel & Bowler, comb., sp. et stat. nov. Basionym: *Ramalina combeoides* Nyl. var. *robusta* R.H. Howe, Bryologist 16: 106. 1913. Holotype: Palmer s.n. 1890, Agiabampo, Mexico (US!).
- Niebla tigrina* (Follm.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina tigrina* Follm., Willdenowia 4: 227. 1966. Synonym: *Desmazieria tigrina* (Follm.) Follm. & Hun., Willdenowia 5: 208. 1969.
- Niebla subwebbiana* (Nyl.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina scopulorum* R. subwebbiana Nyl., Bull. Soc. Linn. Normmand., Ser. 2, 4: 158. 1870. Synonym: *Ramalina subwebbiana* (Nyl.) Hue, Nouv. Arch. Mus. III. 2. 267. 1890.
- Niebla webbii* (Mont. in Webb.) Rundel & Bowler, comb. nov.
 Basionym: *Ramalina webbii* Mont. in Webb, Hist. Nat. Iles Canar. 3(2): 100. Pl. 6, fig. 4. 1840.

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MYCOTAXON

Vol. VI, No. 3, pp. 500-502

January-March 1978

ON CALOCYBE NAMES

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SUMMARY

The combinations *Calocybe fallax*, *C. cyanea*, *C. cyanella* and *C. rubra* are validated.

INTRODUCTION

Kühner (1938: 211) proposed the generic name *Calocybe* for eight species but did not publish a latin description. Since that time several species have been described in the genus or transferred to it. Donk (1962: 42-43) noted that *Calocybe* Kühner was invalid as a nomen nudum.

Combinations published in *Calocybe* prior to 1962 (when Donk validated the generic name) whether spp. nov. or comb. nov. are also invalid (see Article 43, Stafleu et al. 1972). Fortunately most of the names of species placed in *Calocybe* Kühner have since been validated in *Calocybe* Kühner ex Donk by Donk (1962) and Singer (1962).

A comparison of the list of species compiled by Singer (1975) in the genus *Calocybe* with the names itemized in the Index of Fungi since 1962, reveals four invalid names and one illegitimate name. The four are *Calocybe cyanea* Sing., *C. cyanella* Sing., *C. fibrillosa* Singer and *C. rubra* Rick ex Sing. *Calocybe fibrillosa* is now considered a species of *Lyophyllum* by Singer (in Sydowia, in press). The fifth species actually has a valid name in *Calocybe*, namely *C. naucoria* (Murr.) Singer (1962:47). It was probably not listed in the Index of

Fungi because it was not designated as a new combination. However, the combination is used there and it fulfills all of the requirements for a new combination including proper citation of the basionym. Unfortunately, as explained below there is an earlier legitimate epithet for this species which should have been used.

Peck described *Agaricus fallax* in 1873. Murrill (1914), realizing that Peck's name was a later homonym of *A. fallax* Lasch (1829) and therefore illegitimate, published the new name *Melanoleuca naucoria* Murr. for Peck's species. It was Murrill's name that Singer (1962) transferred to *Calocybe*. However, as Smith (1942) noted, Saccardo (1887: 115) had previously transferred Peck's name to the genus *Tricholoma*. According to Art. 72 (Stafleu et al. 1972), a purported new combination of a valid epithet from an illegitimate name is to be treated as a new species. Hence, the legitimate name for this species is *T. fallax* Sacc. This name predates *Melanoleuca naucoria* Murr. *Agaricus* (*Tricholoma*) *fallax* Pk. was published first by Peck (1873) based on a paper presented to the Buffalo Society of Natural Sciences and not in the 25th report on the N.Y. State Museum of Natural History as indicated by Saccardo (1887). Peck (1875: 72) notes this in the 25th report. *Calocybe fallax* (Peck) Singer (1942) is not valid because of the invalidity of the generic name at the time.

The following new combination and new species are now proposed:

Calocybe Kühner ex Donk

Calocybe fallax (Sacc.) Singer ex Redhead & Singer comb. nov.

Basionym: *Tricholoma fallax* Saccardo 1887. Syll. Fung. 5: 115 (ut "(Peck) Sacc.")

≡ *Agaricus fallax* Peck (1873: 44), nom. illeg., non Lasch (1829: 524);

≡ *Calocybe fallax* (Peck) Singer (1942: 119) nom invalid.

≡ *Melanoleuca naucoria* Murr. (1914: 15);

≡ *Calocybe naucoria* (Murr.) Singer (1962: 47)

Calocybe cyanea Singer ex Redhead & Singer sp. nov. Basionym:

"*Calocybe cyanea* Singer" 1948. Pap. Mich. Acad. Sci. Arts & Lett. 32: 126 (nom. invalid).

Calocybe cyanella Singer ex Redhead & Singer sp. nov. Basionym:

"*Calocybe cyanella* Singer" 1948. Pap. Mich. Acad. Sci. Arts & Lett. 32: 124 (nom. invalid).

Calocybe rubra Rick in Singer ex Redhead & Singer sp. nov. Basionym:

"*Calocybe rubra* Rick in Singer" 1948. Pap. Mich. Acad. Sci. Arts & Lett. 32: 126 (nom. invalid).

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* This date is based on a list of publication dates of Peck's reports distributed by G.C. Ainsworth in 1964.

MYCOTAXON

Vol. VI, No. 3, pp. 503-507

January-March 1978

NOTES ON CLAVARIOID FUNGI. XVI. CLAMPLESS TAXA IN CLAVULINOPSIS.

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ABSTRACT

Clavaria longispora is described from fresh material, and the problem of clampless states in *Clavulinopsis* is reviewed.

Corner (1967) described *Clavaria longispora* from dried specimens at BPI. Petersen (cf. Petersen & Olexia, 1969) examined the type specimen, concluding that it represented a clampless *Clavulinopsis*, and strongly indicated its close similarity to *Clavulinopsis laeticolor* (Pk.) Pet. This assumption was born of experience, not fact, in that my only exposure to such forms had been through *C. laeticolor*, and even though the spore dimensions of *Clavaria longispora* did not accurately match those of *Clavulinopsis laeticolor*, the association was promoted, even with some force.

Recently, however, a fresh specimen of *Clavaria longispora* (Knoxville, TN, 30.x.77, coll. O. Mundt, TENN no. 40469) was given me, affording an opportunity to note color and habit as well as microscopic characters. This specimen may be described as follows:

Fruit bodies (fig. 1) up to 3 cm long, up to 2 mm thick, simple, gregarious to densely caespitose in groups up to 15, often geniculate or sinuous; stipe hardly distinguishable from hymenial area, concolorous with it; club "salmon orange*" to "capucine orange" (Royal Horticultural Society color chart: orange group 28C-D, 29A); apex tapering gradually when young, in maturity broadening somewhat to hemispherical, concolorous with club until withering slightly in age, and then becoming "burnt sienna." Taste and odor none. On soil beneath grass.

Tramal hyphae hyaline, parallel, without clamp connections, of two general width ranges. Basidia 40-50 X 6-8 μ m, clavate, without clamp connections, of two kinds; a) thin-walled, with homogeneous contents, and b) thick-walled, often with one or more adventitious septa (fig. 3)

* colors in quotes from Ridgway (1912)

and multiguttulate contents, the guttules refringent under phase contrast; sterigmata (1)-2-(3-4), divergent, somewhat cornute, up to 8 μ m long (when 2 per basidium).

Spores (fig. 2) 8.1-9.6 (11.1) X 3.7-4.8 (5.9) μ m (see Table 1 for statistics), elongate-ovate to amygaliform, smooth, hyaline; contents homogeneous to multiguttulate (at maturity?), the guttules refringent under phase contrast; wall thin; hilar appendix papillate, up to 0.7 μ m long.

Identification of this specimen prompted a reexamination of the taxon, especially in light of my criticism (Petersen & Olexia, 1969) of Corner's (1967) assumption that the fruit bodies of the type "seem to have been pink when fresh." Of those specimens reported in 1969, several were available for study, or drawings of spores and other structures had been retained, and all of this was again digested. The following conclusions can be reported:

1. *Clavaria longispora* (type specimen) and the collection described above are conspecific, and represent clampless fruit bodies of *Clavulinopsis gracillima* (Pk.) Pet. (= *Clavaria luteo-alba* Rea).

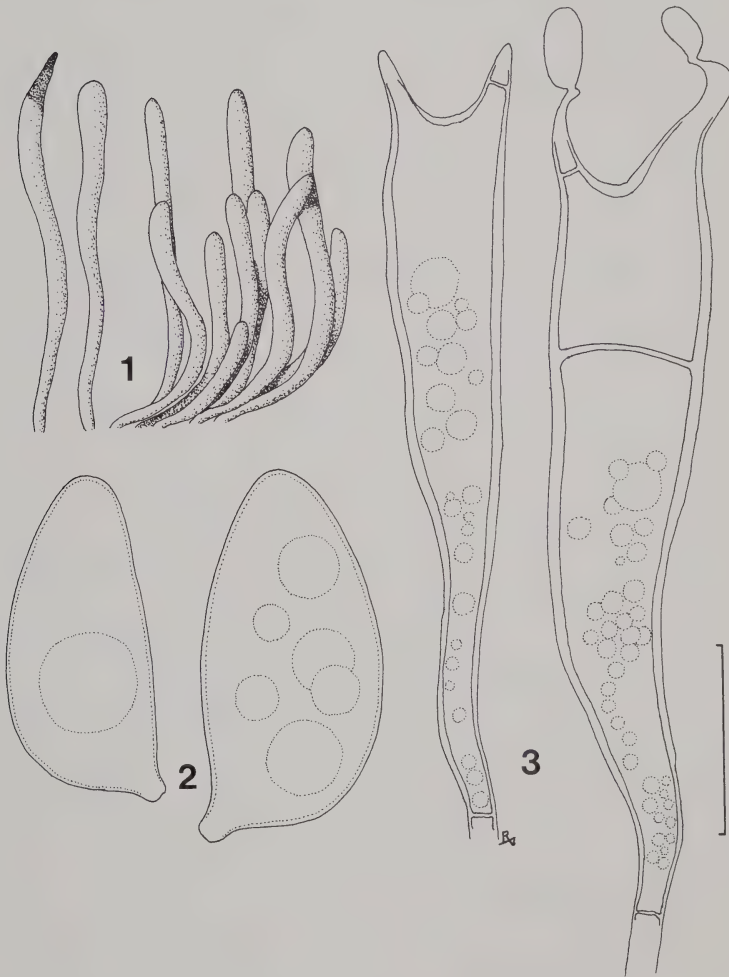
2. No other specimens reported by me (cf. Petersen & Olexia, 1969:1137) were contaxic with these two collection, but represented a clampless state of *Clavulinopsis laeticolor*. Table 1 shows spore statistics in support of this conclusion, especially if combined with fruit body colors reported previously.

3. Thick-walled basidia have been noted in both taxa. They are not uncommon, and have been reported also in *Clavulinopsis corniculata* (Petersen, 1971). Until observing nearly mature spores on such basidia in the collection described above, such basidia were thought to be sterile, but now seem fertile, at least occasionally.

Several taxa of *Clavulinopsis* now have been reported to produce clampless fruit bodies: *C. laeticolor*, *C. corniculata* (Fr.) Corner (Maas Geesteranus, 1976), *C. gracillima*, *C. fusiformis* (Sow. ex Fr.) Corner, *C. amoena* (Zoll. & Mor.) Corner and *C. subtilis* (Fr.) Corner (for the latter three, cf. Corner, 1970:64, but without documentation). Full documentation is available to support the association between *Clavaria longispora*, *Clavulinopsis gracillima* and *C. luteo-alba* (Corner, 1967; Petersen, 1967; Petersen & Olexia, 1967, 1968), and between the clamped and clampless states of *C. laeticolor* and *C. pulchra* (Pk.) Corner (Petersen, 1965, 1968; Petersen & Olexia, 1967).

That the clampless state of *Clavulinopsis gracillima* has been given a name in *Clavaria* opens the question of such practice in general: should the clampless states of *Clavulinopsis corniculata* and *C. laeticolor* also be named in *Clavaria* (Subg. *Clavaria*)? I think not, for at least two reasons.

First, if such forms are really anamorphic (i.e. do not exhibit a perfect state) they deserve only anamorphic names, not names in a teleomorphic genus (i.e. exhibiting a perfect state, such as *Clavaria*). To give them teleomorphic names would be to confuse the issue and to wreck havoc on Art. 59 of the ICBN. Second; although the absence of clamp connections would consign such forms to *Clavaria* (if karyogamy and



Figs. 1-3. *Clavaria longispora* Corner. Fig. 1. Fruit bodies. Fig. 2. Spores. Fig. 3. Thick-walled basidia. Standard line = 5 μ m for spores, 10 μ m for basidia, 1.5 cm for fruit bodies. TENN 40469.

Table 1.
Spore data for *Clavulinopsis* specimens

Specimen	Dimensions	$\underline{E}^1$	$\underline{E}^m$	$\underline{L}^m$
<i>C. longispora</i> ^{2,5} (type)	9.2-10.7 X 4.6-5.0	1.93-2.31	2.07	9.98
<i>C. longispora</i> ⁵ (TENN no. 40469)	8.1-11.1 X 3.7-5.9	1.77-2.20	1.95	9.03
<i>C. gracillima</i> ³ (type)	8.2-9.9 X 3.9-5.0	1.93-2.31	2.07	9.16
<i>C. luteo-alba</i> ⁴ (type)	7.4-9.6 X 4.1-4.8	1.75-2.00	1.87	8.23
<i>C. laeticolor</i> (type)	5.9-6.7 X 4.4-5.2	1.14-1.33	1.24	6.15
<i>C. pulchra</i> ³ (type)	4.8-7.4 X 3.7-5.7	1.04-1.60	1.34	5.93
<i>C. laeticolor</i> ^{2,5} (Minnesota)	7.5-9.2 X 5.0-6.4	1.31-1.73	1.43	8.16
<i>C. laeticolor</i> ^{2,5} (RHP 1817)	6.4-8.2 X 5.0-5.7	1.19-1.50	1.33	7.06
<i>C. laeticolor</i> ^{2,5} (RHP 1277)	6.7-9.3 X 5.2-6.7	1.20-1.57	1.36	7.67
<i>C. laeticolor</i> ^{2,5}	6.0-6.7 X 4.6-6.0	1.06-1.36	1.19	6.49

¹ $\underline{E}$ = length $\div$ width; $\underline{E}^m$ = average $\underline{E}$; $\underline{L}^m$ = median length.

²Reported previously (Petersen & Olexia, 1969), but remeasured.

³Reported previously (Petersen & Olexia, 1967), but remeasured.

⁴Reported previously (Petersen, 1967), but remeasured.

⁵Clampless fruit bodies.

meiosis were present), their affinities are obviously with *Clavulinopsis* through hyphal construction and fruit body morphology. To give them names in *Clavaria* would be to undermine these genera on assumed phylogenetic grounds.

Finally, uncovering such associations raises at least two additional possible ramifications. First; two-spored taxa in *Clavaria* should be surveyed carefully, perhaps to reveal more clampless states of *Clavulinopsis* masquerading under names in *Clavaria*. Second; consideration should be given to clamped, clampless, and partially clamped taxa in *Ramaria* to reveal the mechanism at work there. Surely clues may be gained on this entire problem from work already accomplished in the Agaricales.

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Vol. VI, No. 3, pp. 508-510

January-March 1978

A NEW SPECIES OF TAENIOLELLA HUGHES

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ABSTRACT

A new species of *Taeniolella* which differs from known species in wall ornamentation is described as *T. bilgramii*.

Hughes (1958) described the genus *Taeniolella* with *T. exilis* (Karst.) Hughes as the type species. The genus accommodated dematiaceous hyphomycetes which produce phragmosporous conidia in chains from conidiogenous cells on non-specialized conidiophores. He transferred the names of 14 species from other genera. Ellis (1971, 1976) described and illustrated 12 species. In this communication an undescribed species is reported.

It differs distinctly from these species in the wall ornamentation of the conidia. It is named in honour of Professor K. S. Bilgrami, whose contributions to fungi are well-known.

TAENIOLELLA BILGRAMII S. S. & S. M. Reddy, sp. nov.

Coloniae punctiformes, pulvinatae, olivaceobrunneae; mycelium immersum, subhyalinum, ramosum, septatum, 2.0-2.5 μm crassum; conidiophora semimacronemata, mononemata, caespitosa vel sparsa, plerumque brevia, simplicia, 7.5-57.5 (medio 18.5), pro more 12.5-25.0 μm longa, 1.25-2.5 (medio 2.0), pro more 2.5 μm crassa, simplicia, raro basim versus ramosa, subhyalina, levia, continua. Cellulae conidiogae monoblasticae, integratae, terminalis determinatae, ellipsoideae, olivaceo-virides, leves, 17.5-58 μm longae, 1.75-3.0 μm crassae; conidia in catenulis longis, acropetalis, simplicibus vel ramosis producentes. Conidia in catenulis longis conjunctis, frequentes difficiliter secedentia acrogena, recta vel flexuosa, fusiformia, 7.5-60.0 (medio 27.5) μm longa, 3.75-10.0 (medio 5.4) μm crassa, 1-5-septata, tunica incrassata, sinuata, lumine constricto, frequenter prominulis dentiformibus tuberculata.

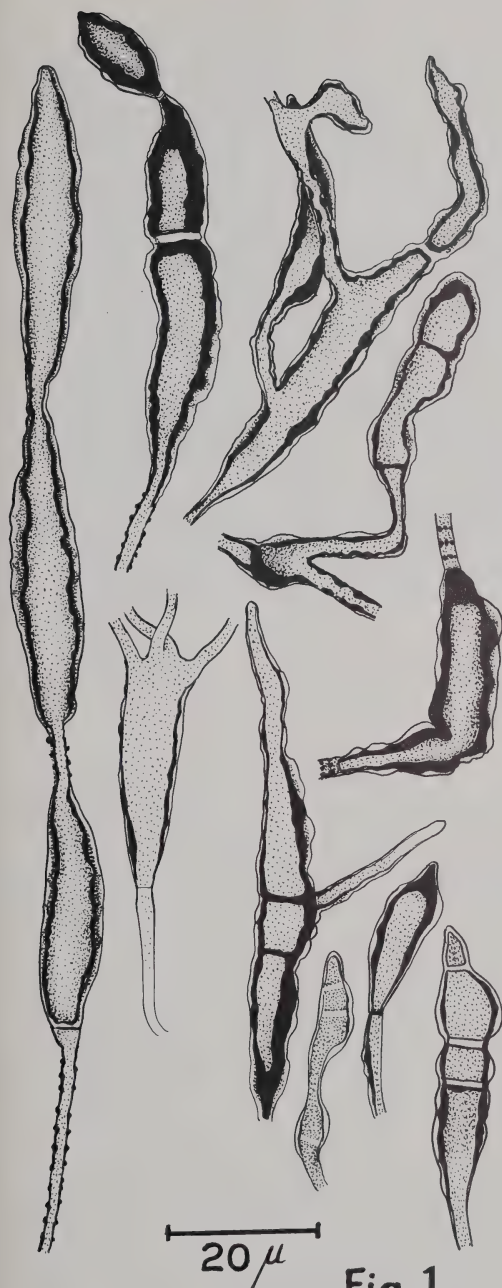


Fig. 1

Colonies punctiform, pulvinate, olivaceous-brown; mycelium immersed, subhyaline, branched, septate, 2.0-2.5 μm thick, conidiophores semi-macronematous, mononematous, caespitose or scattered, simple, 7.5-57.5 (av. 19.5) μm , usually 12.5-25.0 μm long and 1.25-2.5 (av. 2.0) μm , usually 2.5 μm wide, simple, rarely branched near the base, subhyaline, smooth, aseptate. Conidiogenous cells monoblastic, integrated, terminal, determinate, ellipsoidal, olivaceous-green, smooth, 17.5-58.0 μm long $\times$ 1.75-3.0 μm wide, producing conidia in long acropetal, simple or branched chains (FIG. 2). Conidia in long chains often seceding with difficulty, acrogenous, straight or flexuous, fusiform, 7.5-60.0 μm long (av. 27.5 μm) and 3.75-10.0 μm wide (av. 5.4 μm), 1-5-septate, conidial wall thick (leaving narrow lumen), sinuate, often tuberculate with irregularly den-

FIG. 1. Camera lucida drawings of conidia and conidiophore of *T. bilgramii*.



FIG. 2. Photomicrograph showing the conidiophore and conidia of *T. bilgramii* ($\times 380$).

tate ornamentation (FIG. 1).

Collected on phyllodes of *Agave americana* Linn., Osmansagar, Hyderabad, 23rd Oct. 1976, S. S. Reddy. Specimen deposited in herbarium of the Botany Department, Kakatiya University, Warangal as KUMH 697 (HOLOTYPE) as well as CMI, Kew, England as IMI 209947 (ISOTYPE).

ACKNOWLEDGMENT

Thanks are due to Prof. U. B. S. Swami, Head, Department of Botany, Kakatiya University, Warangal, for encouragement.

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MYCOTAXON

Vol. VI, No. 3, pp. 511-516

January-March 1978

BOOK REVIEWS

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ON J. CRAMER'S MYCOLOGICAL PUBLICATIONS

In twenty years, from 1956 to 1977, the publisher J. CRAMER has contributed greatly to the diffusion of literature in botanical sciences, including mycology and lichenology, in the fields of taxonomy and floristics. More than 20 entitled series or collections of botanical books have been published or are still continued, more than half of them under the editorship of J. Cramer himself, the others being edited by scientists. These series each consist of a few to as many as 105 volumes. In addition to these, a number of books published separately, not in series, bring J. Cramer's contribution to botany to about 800 volumes.

In addition, J. Cramer assumes responsibility for publishing several journals. NOVA HEDWIGIA, a journal of cryptogamy, started in 1959 and including now 28 volumes of about 900 pages each, is the best known. The specific contributions of Cramer to mycological publishing is important enough to detail it here.

In 1967 Cramer initiated and still continues BIBLIOTHECA MYCOLOGICA, a series containing both ancient and recent mycological works. The 60 volumes of this series are mostly of significant scientific value, though variable in size and importance. When voluminous, they are cloth bound, when smaller, paperback. Reprinting of older books is usually of high quality. Recent papers are either typeset or offset from authors' copy. The appearance of such offset printing depends greatly upon the authors' manuscripts. Some authors clearly need more skill in preparing their camera-ready manuscripts, taking advantage of the suggestions and facilities the publisher certainly is able to provide. Among possible improvements, I'd suggest improving the clarity by subdivision into chapters by using, *e.g.*, various sizes of typeface or transfer letters adequately spaced for headings, and the general economy of space (particularly the avoidance of double-spaced typing!). The high price of some of the books could have been halved by intelligent attention to such details by the authors, or by more stringent typing requirements by the publisher. In this series recent works by Klebs, Horak, Clemenson and Sundberg, as well as reprints of works by Hennings and by Murrill are in preparation.

Two other mycological series are also published by J. Cramer. DIE PILZE MITTELEUROPAS consists of 5 volumes published from 1956 to 1967. FUNGORUM RARIORUM ICONES COLORATAE, a series started in 1966 with D. A. Reid's beautiful book, "Coloured illustrations of rare and interesting fungi," is continued, and now contains 8 volumes. Both series have caught the attention of mycologists and of University and State libraries for their high quality - especially of their illustrations.

Two reprinted collections issued by J. Cramer must be mentioned: the journal ANNALES MYCOLOGICI (1903-1944), of 44 volumes, and RABENHORST'S

KRYPTOGAMENFLORA VON DEUTSCHLAND, ÖSTERREICH UND DER SCHWEIZ, I. PILZE (1884-1920), reprinted in 1963, in 10 volumes.

Beyond these five series of books on mycology, 19 of the 55 volumes issued as BEIHEFTE ZUR NOVA HEDWIGIA deal with mycology. Also, 29 mycological papers of shorter length have been separately reprinted from NOVA HEDWIGIA. Cramer also printed ZEITSCHRIFT FÜR PILZKUNDE from 1968 to 1972, and MYCOLOGIA MEMOIRS vol. 6.

A number of important books have, however, been published separately from any series, works of Fuckel, Karsten, von Höhnelt, Zycha, Dennis, von Arx, Singer, Karling, and others. There are 21 such books of broad, nearly textbook, scope, dealing with large groups of fungi.

For lichenology, J. Cramer's contribution is the publication of two volumes in DISSERTATIONES BOTANICAE, 6 as BEIHEFTE ZUR NOVA HEDWIGIA, 9 in BIBLIOTHECA LICHENOLOGICA started in 1973, and 7 as reprinted papers from NOVA HEDWIGIA, plus 10 volumes published separately. A journal, HERZOGIA, organ of the bryological-lichenological workgroup for central Europe, edited by Follmann, Frey, Koppe and Poelt, has been issued by Cramer since 1969.

Not including periodicals, J. Cramer has published 147 items in mycology and 22 in lichenology, beginning in 1956. Some, not previously reviewed in these pages, are detailed here.

CHYTRIDIOMYCETARUM ICONOGRAPHIA, by John S. KARLING, xiv + 414 p., 175 pl., 4°, cloth bound, 1977. J. Cramer. Price, DM 200.-

A subtitle modestly qualifies this book as "an illustrated and brief descriptive guide to the chytridiomycetous genera with a supplement of the Hyphochtriomycetes." The descriptive characters, sexual reproduction, life history and ecology of each of the 174 genera of these two classes of fungi are critically presented and illustrated. The style, far from being straight technical, is agreeable and fluent, and the illustrations, of excellent full-page line drawings facing the text, make this book very attractive and will contribute greatly to a larger knowledge of these often neglected fungi. One can find here again the excellence of a monograph such as Thaxter's on the Laboulbeniaceae.

NOVA SCOTIAN BOLETES, by Darryl W. GRUND and Kenneth A. HARRISON, in Bibliotheca Mycologica vol. 47, 283 p., 80 fig., 68 b. & w. pl., 8°, cloth bound, 1976. J. Cramer. Price, DM 60.-, standing orders, DM 48.-

This book presents the descriptions of 80 species of boletes of Nova Scotia, Canada, based on freshly collected material. The study of the boletes of such a restricted area assumes greater value in view of the unique kind of floristic *carrefour* which this peninsula represents. The genera considered are *Boletus*, *Boletellus*, *Boletinellus*, *Fuscoboletinus*, *Gyroporus*, *Pulveroboletus*, *Strobilomyces*, *Suillus* and *Tylopilus*. The genus *Leccinum* is recorded with only 4 species at this stage, for it needs more investigation. Taxa are described technically by morphology, anatomy and macrochemical tests. Basidia, basidiospores and cystidia of each taxon are illustrated, and carpophores of many species are represented by quality photographs. The book is made of practical use by provision of a clear synopsis of the family Boletaceae, a well-constructed dichotomous key based on accessible characters and an excellent and detailed synoptic key to the species. Some new taxa are described and new combinations made.

GENETISCHE REGULATION DER FRUCHTKÖRPER-BILDUNG BEI HÖHEREN BASIDIO-MYCETEN; MONOKARYOTISCHE FRUCHTEN BEI POLYPORUS CILIATUS, by Ulf STAHL, in Bibliotheca Mycologica vol. 50, 105 p., 16 fig., 8°, paperback, 1976. J. Cramer. Price, DM 30.-, standing orders, DM 24.-

This thesis, carried out under Prof. K. Esser's direction, consists of two parts. In the first, an analysis of mechanisms underlying the A and B incompatibility factors in tetrapolar systems leads to the distinction of these factors as *regulating* components in sexual morphogenesis from the *regulated* set of genes which, in each partner, codifies sexual morphogenesis itself. Further analysis of the four main patterns of control by A and B factors, only one of which results in a clamped fertile dicaryon, shows that these factors are gene-complexes acting specifically in the regulation of partner genomes. This is demonstrated in the second part through the mating of compatible and incompatible monokaryotic strains of *Polyporus ciliatus* which the author skilfully segregated and analysed up to definition of their genotype and production of monokaryotic fructifications. A *stimulating* and *inhibiting* mechanism of the incompatibility factors exists which determines dicaryotic *vs.* monokaryotic fructification.

GENETISCHE KONTROLLE DER PHENOLOXYDASE "LACCASE" DES ASCOMYCETEN PODOSPORA ANSERINA, by H. PRILLINGER, in Bibliotheca Mycologica vol. 51, 148 p., 31 fig., 14 tab., 8°, paperback, 1976. J. Cramer. Price, DM 40.-, standing orders, DM 32.-

This dissertation, carried out under Prof. K. Esser's direction, deals with the genetical analysis of laccase-deficient mutants of *Podospora anserina*, essentially a biochemical experimental investigation of the genetic characterisation of the fungal mutants. Such a specialized study might attain a broader audience if it were published in an appropriate journal rather than in Bibliotheca Mycologica.

THE GENUS LEPTONIA ON THE PACIFIC COAST OF THE UNITED STATES, including a study of the North American types, by David L. LARGENT, 286 p., 24 b. & w. phot. pl., 8°, cloth bound, 1977. J. Cramer. Price, DM 80.-, standing orders, DM 64.-

Following Romagnesi's treatment of the rhodophylloid fungi in one genus, *Rhodophyllus*, these fungi are now separated into six genera, *Claudopus*, *Pouzarella*, *Alboleptonia*, *Nolanea*, *Entoloma* and *Leptonia*. *Entoloma* and *Pouzarella* have been investigated by Hesler and Mazzer respectively in recent years. The author summarizes here 10 years of collecting and herbarium studies of *Leptonia* in the United States, and especially on the west coast. One hundred forty-two taxa are described carefully and documented with accurate redescriptions of the type material of the accepted epithet and of its synonyms. Illustrations of carpophores, cuticle structure, cystidia and spores are given by means of black and white photographs, but only for a few taxa; no line drawings are given. The dichotomous keys are scattered through the book at each subgenus, section and subsection, but there is fortunately a good synoptic key to guide the reader. An account, more detailed than just a short paragraph, on the segregation and diagnosis of the genus *Leptonia* from the other rhodophylloid genera might have been justified and informative. This book is an important contribution to taxonomy: it is the first one devoted to *Leptonia*, with 24 new species, 19 new varieties and 2 new forms described, 48 new combinations and 1 new name proposed.

COMPLÉMENTS À LA "FLORE ANALYTIQUE," by R. KÜHNER and H. ROMAGNESI, in *Bibliotheca Mycologica* vol. 56, 484 p., ill., with index by C. BAS, 8°, cloth bound, reprinted 1977. J. Cramer. Price, DM 100.-, standing orders, DM 80.-

The reprinting of the 9 serial papers published by Kühner and Romagnesi from 1954 to 1958 in different French periodicals as supplements to their "Flore Analytique" is a fortunate idea, for it brings together all these additional data on *Rhodophyllum*, *Lactarius*, the Pleorotaceae, Marasmiaceae, Tricholomataceae, *Cortinarius*, *Inocybe*, the Naucoriaceae, Coprinaceae, Lepiotaceae and Volvariaceae, and provides an index for them.

LE GENRE AMANITA PERSEON, by J. E. GILBERT, in *Bibliotheca Mycologica* vol. 53, 186 p., 13×19 cm, paperback, reprinted 1976. J. Cramer. Price, DM 40.-, standing orders, DM 32.-

This little book is an interesting document for mycologists interested in *Amanita*, for it shows the species concepts current in France in 1918. The 30 species of the three subgenera, *Amanita*, *Amanitopsis* and *Limacella*, were so vaguely or controversially described at that time that the author accepted no fewer than 68 infraspecific taxa to accommodate the divergent opinions. The then current use of such a system of synonymising taxonomic concepts (misapplied names and description references) as well as correctly applied names, instead of synonymising *epithets* as unequivocally based on type material, is the only explanation for the development of such an intricate and loose taxonomy.

A TAXONOMIC AND NOMENCLATURAL STUDY OF THE GENUS AMANITA SECTION AMANITA FOR NORTH AMERICA, by David T. JENKINS, in *Bibliotheca Mycologica* vol. 57, 106 p., 12 col. phot., 22 b.& w. phot., 8°, paperback, 1977. J. Cramer. Price, DM 60.-, standing orders, DM 48.-

Eleven species and seven varieties of one of the six sections of *Amanita* are described here, supported by some type re-examinations. A new variety of *Amanita muscaria* is proposed. This is the total scope of this paper, which regrettably shows numerous defections in preparing the author's typed, camera-ready copy, e.g., missing punctuation, spelling or typing errors, inconsistent, incomplete or erroneous literature citations, chronologically mixed nomenclature, use of unexplained abbreviations, and consistent misplacing of the reference to the illustrations under the entry "type material." Not all color photographs are of high quality, nor are all of the black and white photographs; none are provided with a scale.

Criticism has been leveled at Cramer for the high price of many of the books he publishes. Part of the high cost is unquestionably caused by necessarily small press runs for highly technical papers such as this. Cramer has provided me with a cost breakdown for publication of this book, from which one finds that 82% of the production costs are consumed by the printing and paper costs of the six colored plates! The purchaser pays nearly \$20 of the approximately \$25 cost for 12 small color pictures of uneven quality. The author himself assumed responsibility for the high cost of his thesis publication by deciding that color plates were an essential. Once having made that decision, the author could have cut costs by cropping and grouping photos (both color and black and white), by avoiding the repeating of species names, nomenclators and type citation caused by grouping type descriptions at the end of the book, by various other typing economies, particularly by single spacing (everything is double-spaced). But then the book would have been just a thin journal article, and the prestige of having published a "book" would be lost.

THE BOLETINEAE OF FLORIDA, with notes on extralimital species, by Rolf SINGER, in *Bibliotheca Mycologica* vol. 58, 305 p., ill., 8°, cloth bound, reprinted 1977. J. Cramer. Price, DM 60.-, standing orders, DM 48.-

This is 4 reprinted articles from *Farlowia* 2: 97-141, 1945, 2: 223-303, 1945, 2: 527-567, 1946, and the *American Midland Naturalist* 37: 1-135, 1947, which is completed with a general index. Contrary to Kuntze, who "amused himself by transferring practically all known species of *Boletus* which he copied from Saccardo, to *Suillus*" although "Personally, he has never seen any of them except perhaps *Boletus edulis* in his kitchen," (Singer, p. 279), the author undoubtedly did see all of those he described and commented on so accurately. This book is a milestone in the study of boletes.

LOWER PLANTS OF THE INDIAN SUBCONTINENT. A collection of papers by Indian scientists. *Beihefte zur Nova Hedwigia* vol. 47, 648 p., ill., 8°, paperback, 1977. J. Cramer. Price, DM 200.-, standing orders, DM 160.-

About half of this book deals with taxonomic and developmental mycology and with plant pathology. Among the 28 papers attention is drawn to those on coprophilous fungi (*Thielavia* and *Chaetomidium*) by Lohda, on *Hypocrea* by Kar and Maity, on the Chaetomiales by Mukerji and Saxena, on *Meliola* by Srinivasulu, on aquatic pyrenomycetes by Tilak and Kulkarni, on ascocarp development of *Tryblidaria* by Anahosur and of *Tryblidiella* by Seshadri and Muthappa. There are also some papers of much lower quality. The figures on p. 217 should be on p. 624. The other half of the volume deals with the algal flora of Indian soils.

FUNGORUM LIBRI BIBLIOTHECAE JOACHIM SCHLIEMANN, Books and Prints of Four Centuries, edited by Winfried UELLNER, 287 p., 8°, cloth bound, 1976. J. Cramer. Price, DM 60.-

The Joachim Schliemann Library is an outstanding collection of literature on fungi consisting of some 2000 titles. Its special value is seen in its wide range from the classics of mycology such as the major iconographies, to recent books, booklets, and journals, as well as unpublished manuscripts. This catalogue, which unfortunately lacks an introduction, provides titles with descriptions, references to biographies, bibliographic listings and reviews in modern journals. The book is interestingly illustrated with 34 facsimile plates of titlepages of old and rare works on mycology. The book is printed for the Elias Fries Gesellschaft für Pilzforschung, Hamburg.

PILZKUNDE, by J. A. von ARX, vi + 296 p., 122 fig., 8°, paperback, third ed., 1976. J. Cramer. Price, DM 29.50

Since the second (1968) edition of this book, Professor von Arx has made an extensive investigation on the taxonomy and systematics of the Endomycetes, especially on the Endomycetales. This order consists of 4 families. The Endomycetaceae is enlarged to include part of the Dipodascaceae and the Eremascaceae of 1968; the Ascoideaceae is the remainder of the Dipodascaceae; the Saccharomycetaceae includes now the Spermothoraceae, and the Saccharomycodaceae is a recent family. These changes have been integrated into this new edition. This textbook is very well documented with abundant and up-to-date literature citations. The illustrations are profuse and demonstrative. The volume is reasonably priced, and is to be recommended to any student in mycology.

EPIPHYTISCHE FLECHTEN ALS BIOINDIKATOREN DER LUFTVERUNREINIGUNG dargestellt an Untersuchungen und Beobachtungen in Bayern, by Peter JÜRGUNG, in *Bibliotheca Lichenologica* vol. 4, 164 p., 49 maps and fig., 8°, paperback, 1975. J. Cramer. Price, DM 50.-, standing orders, DM 40.-

EPIPHYTIC LICHENS AND AIR POLLUTION IN THE NETHERLANDS, by Toke DE WIT, in *Bibliotheca Lichenologica* vol. 5, 227 p., 126 maps and fig., 8°, paperback, 1976. J. Cramer. Price, DM 60.-, standing orders DM 48.-

These two ecological studies show clearly the relation between the regression of the epiphytic lichen flora and several kinds of air pollution, particularly pollution by SO_2 , which results in the development of "epiphytic deserts" in large urban or industrial zones. The first paper concerns Bavaria, with München as a center; the other covers the whole of The Netherlands wherein six epiphytic deserts are in progress of formation. Up to 38 species of epiphytic lichens on 8 different tree species were investigated and their distributions mapped.

ONTOGENETISCH-SYSTEMATISCHE STUDIEN ÜBER ERIODERMA im Vergleich mit anderen cyanophilen Flechtengattungen, by Gerhard KEUK, in *Bibliotheca Lichenologica* vol. 6, 20 fig., 217 b. & w. phot. in 60 pl., 8°, paperback, 1977. J. Cramer. Price, DM 60.-, standing orders, DM 48.-

This is a detailed investigation on the thallus and apothecium structure in 7 genera of the Peltigeraceae, 3 of the Stictaceae, 1 of the Placynthiaceae, 3 of the Coccocarpiaceae and 4 of the Pannariaceae in the Lecanorales, in order to define an adequate position for the genus *Erioderma*. Developmentally and structurally, *Erioderma* appears to be most closely related to the Pannariaceae, close to *Parmeliella pyenophora*. Twelve species of the genus are then redescribed (but with too few of them - including the type species - based on studies of type material). This paper is certainly a valuable contribution to the knowledge of the Lecanorales and their taxonomy. The reader may be confused by the "dissertation" or "thesis" style of the paper with headings and subheadings all typed alike. (Several of the other books reviewed above have the same flaw.) The reader gets confused, loses his way, goes back to the contents, and wastes time in finding data in an unclearly structured text. In this reviewer's opinion, many theses must be restructured, and planned for book use, before ever being produced as a published text.

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ERRATA AND ADDENDA

Volume IV

- p.362, l.5, delete R.P. Southby, CMI 34813.
 p.374, l.41, for 1969). read 1969; Sun and Huppert, 1976).
 p.384, l.14, for CMI 34813 read R.P. Southby, CMI 34813
 p.386, l.33, for (Fig. 5E) read (Fig. 6E)
 p.390, l.3, for (Figs. 7A,7D) read (Figs. 7A,7D)
 p.390, l.26, for *M. striatosporus* read *M. striatosporum*
 p.413, l.26, for Gmnoascaceae read Gymnoascaceae
 p.427, l.11, for Alaska read South Pacific
 p.431, l.2, for (Figs. 13J-12L) read (Figs. 13J-13L)
 p.452, l.2, after are divided by add thickened septa suggesting double septa (Figs. 17H,17I). Arthroconidia are cylindrical, cuneiform if terminal, discoid in end view, hyaline, later greenish-yellow, often with refractile end walls (Fig. 17K), 2-3 X 2-6µm, mostly 2-3 X 2.5-5.5µm. Chlamydospores are rare. No other spore state was observed.
 p.456, l.10, for (UAMH 1942 and 1943) read (UAMH 1842 and 1843)
 p.456, l.17, for UAMH 1941 read UAMH 1841
 p.456, l.18, for 1943 read 1843
 p.456, l.28, for (UAMH 1841, 1943 and 1975) read (UAMH 1841, 1843 and 1975)
 p.458, l.14, delete
 p.458, l.15, for (from Orr): UAMH 1941, Calif., Huppert (SFVH 129), Orr 0-3226)
 read UAMH 1841, originally from bronchoscopy specimen from patient with pulmonary disease not diagnosed as coccidioidomycosis, S. McMillen, Hektoen Institute, Chicago, (from Orr as Huppert SFVH 129, 0-3226)
 p.458, l.16, for UAMH 1942, Calif., Huppert (SFVH 130), (Orr 0-3283) read UAMH 1842, originally from bronchoscopy specimen from patient with pulmonary disease not diagnosed as coccidioidomycosis, S. McMillen, Hektoen Institute, Chicago, (from Orr as Huppert SFVH 130, 0-3283)
 p.458, l.17, for UAMH 1943, Calif., Huppert (SFVH 149), (Orr ?0-1088) read UAMH 1843, originally from sputum of patient with non-coccidioidal respiratory disease, S. Froman, Olive View Hospital, L.A., (from Orr as Huppert SFVH 149, ?0-1088)
 p.460, l.25, for (UAMH 1941, SFVH 129; read (UAMH 1841, SFVH 129;
 p.460, l.26, for UAMH 1942, SFVH 130; UAMH 1943, SFVH 149) read UAMH 1842, SFVH 130; UAMH 1843, SFVH 149)
 p.475, l.39, for Hubalek, A. read Hubalek, Z.
 p.481, l.27, insert Sun, S.H. and M. Huppert. 1976.
 A cytological study of morphogenesis in *Coccidioides immitis*. Sabouraudia 14(2):185-198.
 p.488, l.15-
 l.29, for Fig. 21 read Fig. 22

Volume VI

- p.130, l.44, for *acetabulum* read *acetabulum*
 p.227, l.41, for *corticola* read *corticolum*
 p.233, l.5, for *SCHIZOXYLON HIPPOPHAES* read (*SCHIZOXYLON HIPPOPHAES*)
 p.241, delete last line
 p.259, l.13, for *venezuela* read *venezuelae*
 p.343, l.29, for (p. read (p. 352).
 p.375-377, throughout, for *lundelli* read *lundellii*

